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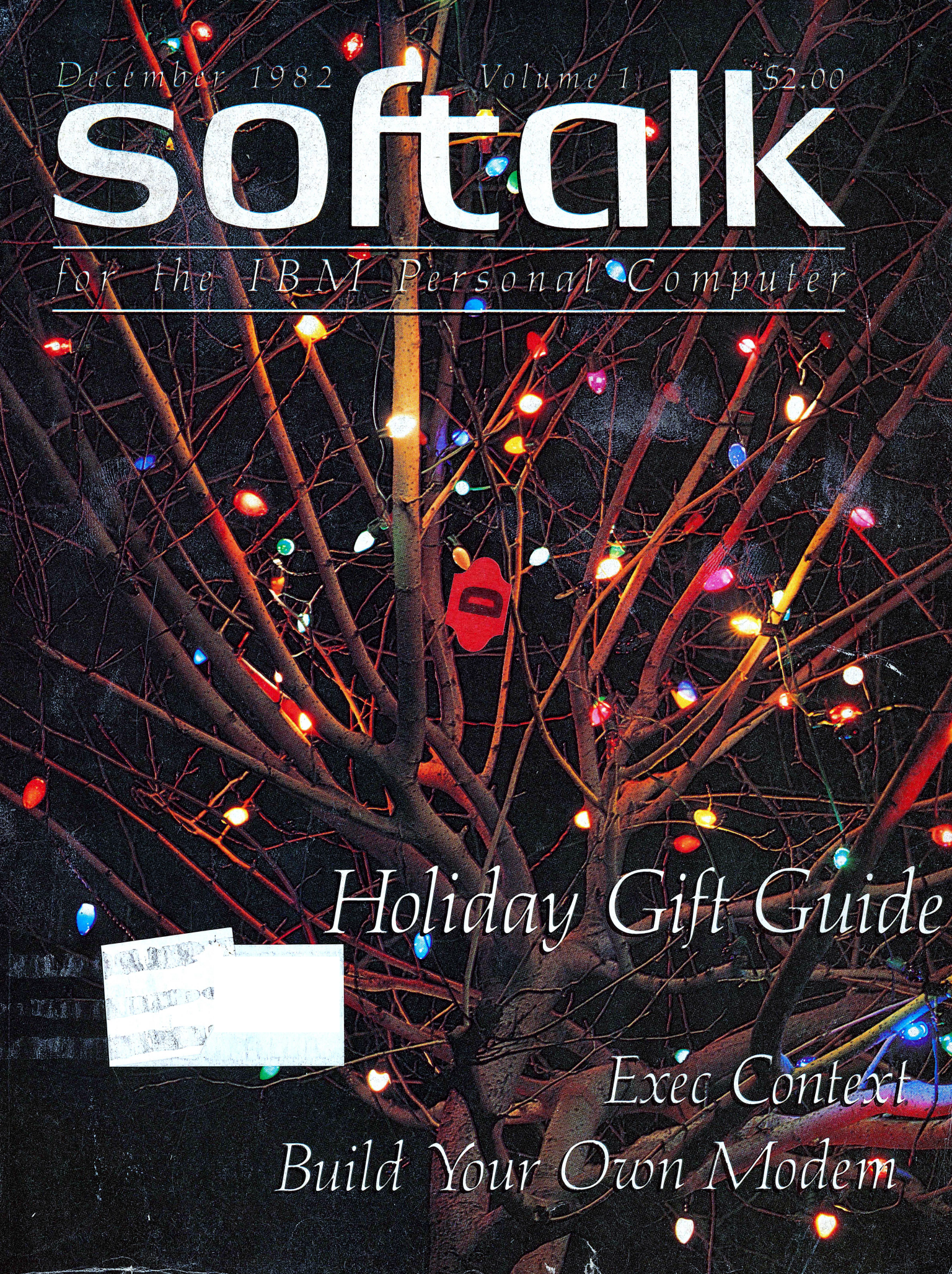
softalk

for the IBM Personal Computer



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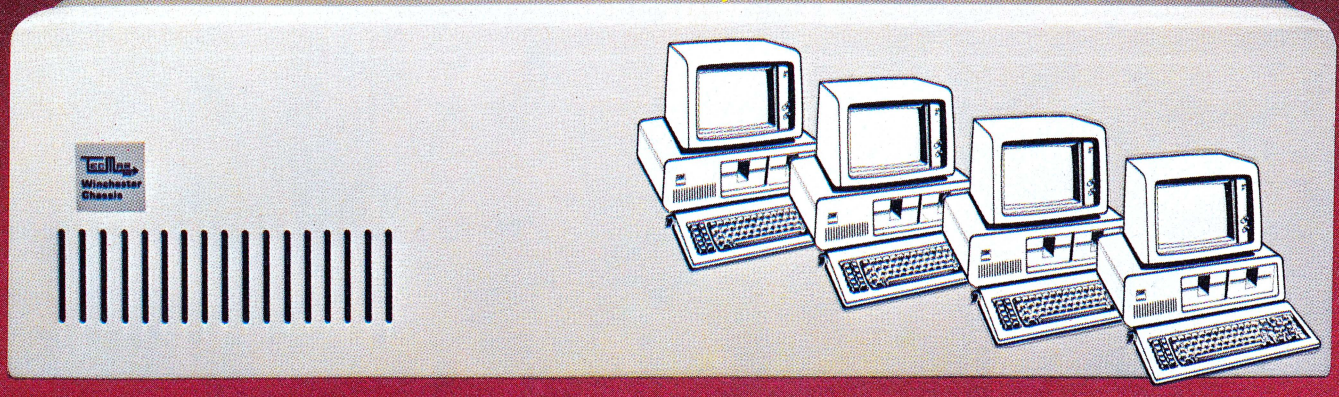

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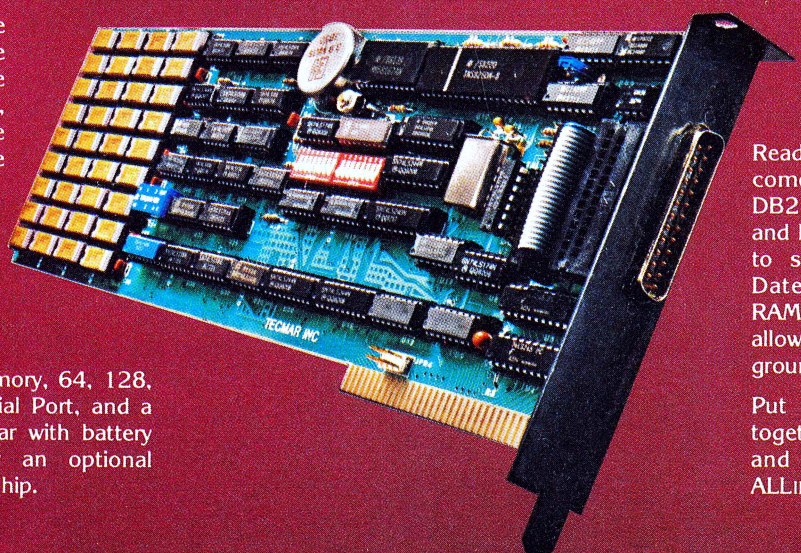

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for the IBM Personal Computer

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crosstalk

Tipped to the Wax

Here's a tip I discovered that ought to be of use to the thousands of readers who have the standard IBM Personal Computer printer, the Epson MX-80.

The paper in my printer was jamming. This was due to too much friction as the paper was pulled around the platen; it got so bad that the paper would stop moving, and the print-out was ruined.

To solve the problem, I ran some waxed paper through the printer, rubbing it back and forth a few times to spread a thin layer of wax onto the aluminum platen. Since then the paper has slipped through with no jamming. To get the waxed paper into my MX-80, I first taped it to some regular paper that was stiff enough to push into the printer. Naturally, you shouldn't run the printer with the waxed paper in it—just rub the waxed paper back and forth and then pull it out. It will do your printer a world of good.

Peter Norton, Venice, CA

Battle Scars

I really like *Softalk for the IBM Personal Computer;* the only thing I can't understand is why it looks like it went through World War III by the time I get it. I don't believe the Postal Service is totally to blame since I get other similar items in reasonably good condition..

The problem seems to be with *Softalk*. Each issue is delivered in worse condition than the previous issue. Although the subscription is complimentary, I still feel that *Softalk* should be able to do something to improve the delivered condition of the magazine. At the rate things are going, I am not sure that I would want to pay for a magazine delivered in such bad condition.

Carol Macknis, College Park, MD

As soon as the Postal Service approves our second-class permit, we will be mailing Softalk for the IBM Personal Computer *in a protective paper wrapper. In the meantime, if you receive a war-torn copy, call or write us. We'll immediately send you, by first class mail, a safely wrapped replacement.*

Specialized Queries

I am having considerable trouble getting UCSD Pascal. In fact, I have had it on order for the past six months. Does anyone know anything about the holdup, or am I a special case?

I am also having trouble getting my IBM printer to print 132 compressed character lines under CP/M-86. It prints pairs of eighty and fifty-two character lines when sent 132 character strings (without carriage controls). The characters are compressed all right. The string just takes two lines.

Robert A. Roberts, Lexington, VA

Something Stupid

I have had so much difficulty with BPI's *General Accounting* package that is marketed through IBM that I am of the opinion that a serious caveat ought to accompany it. I have abandoned it myself and thought I would pass along my experiences.

In the first place, there are lines in Basic in BPI's package that exceed 255 characters. They don't work. Don't bother to go to your local Computerland or Sears or whatever so they will call IBM and get information. The IBM answers relayed back to me are stupid (although I don't believe the authors of the answers are stupid).

When I did get to talk to someone at BPI, they said their strategy is to make the package as difficult to modify as possible, as their answer to the possible piracy problem, and that IBM both supported their position and assisted in this effort.

A real hooker is that the profit and loss statement puts out only a one-line item for income statements, regardless of how many there are, though it apparently sums gross income correctly. But how many accountants will accept this? So far I have found none. And BPI said it was an oversight when they were rushing to market, but they were not going to fix it. What can I say?

Can any of your readers tell me how to change the line heading put out by line 143 of the PL1.bas program from totals to total expenses? This might begin to unlock the programs to where they are useful.

Thomas B. Reifsnyder, Boca Raton, FL

Personal Treasure

The material covered in Beginners' Corner and System Notebook is invaluable to a novice attempting to acquire knowledge of the operation of the IBM Personal Computer. I have access to most published matter on the Personal Computer and nowhere else are the details and background of this material dealt with so understandably. In places the articles repeat some aspects of this material, and where this does occur, it does so to the benefit of the reader. To one who comes to the world of computers with no background experience, this information is a treasure.

Albert R. Frederick, Jr., Boston, MA ▲

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Δ **Vern Raburn,** former vice president of consumer products with **Microsoft** (Bellevue, WA), is now executive vice president and general manager of **Lotus Development** (Cambridge, MA). He will oversee marketing and operations and the launching of Lotus's latest product, *1-2-3*. The program combines a spreadsheet with a database, a graph module, and a text editor. Raburn says he welcomes "the opportunity to work on a key product to fill an important need for integrated productivity tools."

Δ **Compusoft Publishing** (Irvine, CA) has uncovered a bootleg edition of its *Basic Handbook*. The $19.95 book was found selling for $13 at Caves Bookstore in Hong Kong. The pirated edition was printed on cheaper paper, and the illustrations were noticeably darker. The bookstore helped CompuSoft trace the edition to Singapore. **Allan Reed,** general manager at Compusoft, suspects Taiwan may be the source of the pirated books, since the United States has no copyright treaty with that country. Singapore is a free trade port, and most shipments there are exempt from customs searches. Taiwan has long been notorious for counterfeit brand-name computers and other products.

Δ **Information Unlimited Software** (Sausalito, CA) has moved to larger quarters. The company that gave the world *EasyWriter* cites expanded research, development, and marketing as motives for the shift to its new 17,000-square-foot facility. The new address is 2401 Marinship Way, Sausalito, CA 94965; (415) 331-6700. Meanwhile, IUS has announced a contract with **Sears** to make its products available in the expanding chain of Sears Business Systems Centers.

Δ **Lattice** (Hoffman Estates, IL) has announced an agreement to license its C compiler for the **General Automation** Series-16 computer line. The product is a portable compiler designed for use with 8086/8088-based machines.

Δ **Digital Research** (Pacific Grove, CA) has formed a strategic business center for graphics. Under the direction of **Fred Langhorst,** the group will spearhead the company's move into the microcomputer graphics market. The first product will be a CP/M extension called *GSX*, which will expand the operating system's ability to output to devices ranging from plotters to CRTs. **Televideo Systems** (Sunnyvale, CA) has already signed a licensing agreement to bring *GSX* to its 1602G and 1602GH microcomputers, which will run under CP/M-86.

Δ **Software Arts** (Wellesley, MA) has appointed **Bruce H. Rampe** as director of marketing and sales. His initial task will be the promotion of *TK!Solver*, the company's new number-crunching program. Rampe was previously vice president for marketing at Rola, a subsidiary of Esmark, and before that was director of sales at Bose, the hi-fi company.

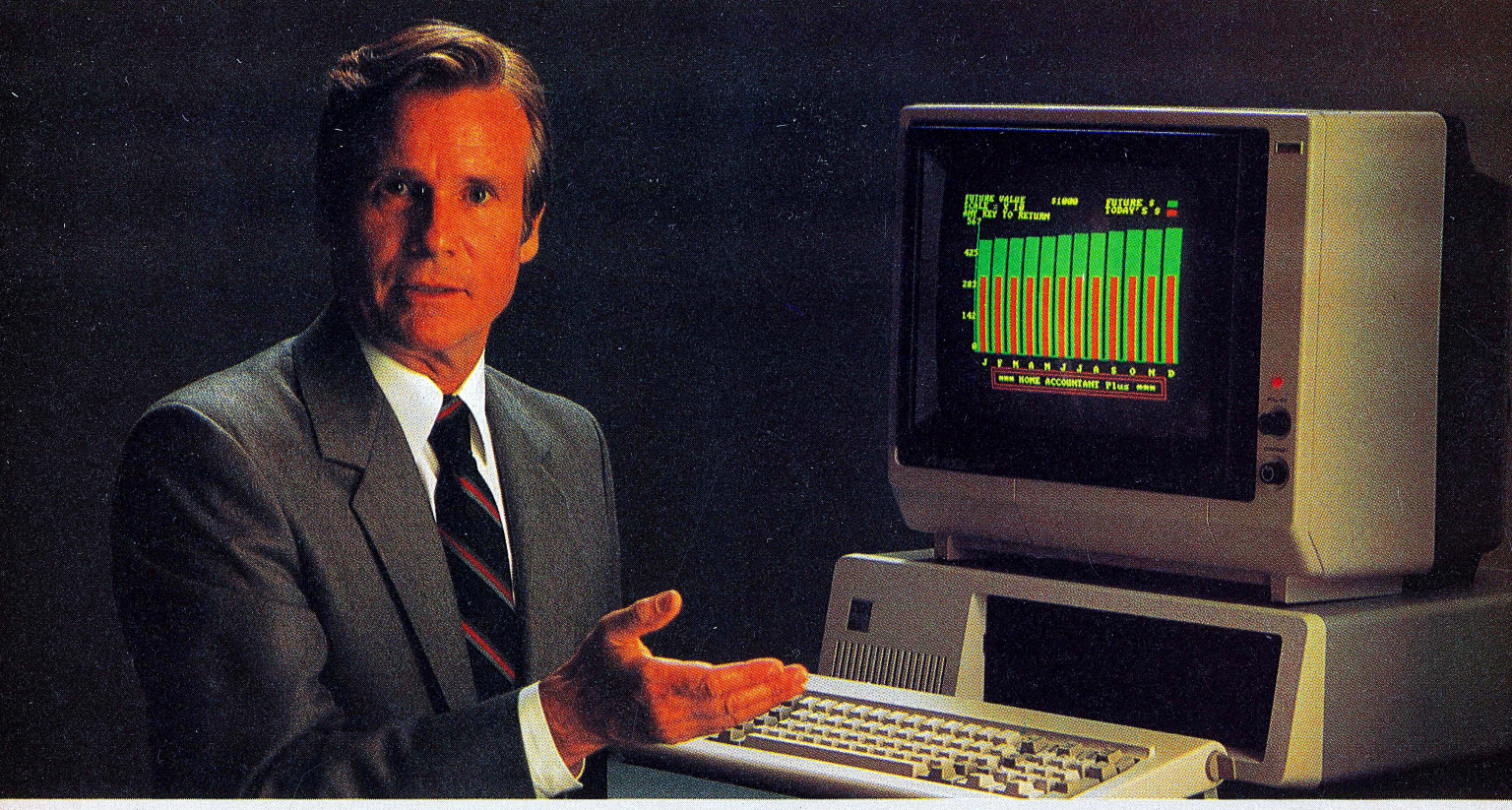
Δ **Micro Peripherals** (Salt Lake City, UT) has named **Jamie W. Johnston** as director of sales. Johnston was formerly employed by Ithaca Intersystems. MPI sells a line of 40, 80, and 136-column dot-matrix printers.

Δ **Jeffrey B. Walden** has joined **Context Management Systems** (Torrance, CA) as communications manager. Walden was previously public relations manager at VisiCorp, and before that was editorial director at *Computer Dealer Magazine.*

Δ **Link Systems** (Santa Monica, CA) has designated **Rick Gibson** as vice president of sales and marketing. Gibson was most recently sales and marketing director for KLH, the consumer electronics manufacturer. Link Systems sells the filing system *DataFax.*

Δ **Starcraft** (Tokyo, Japan) has been licensed to produce and market **Sierra On-Line's** (Coarsegold, CA) software in Japan. Sierra On-Line recently named **Richard S. Sunderland** as executive vice president and chief operating officer, and **T. Eugene Stroud** as vice president of marketing. Sunderland and Stroud had been employees of Informatics and PRC of America, respectively.

Δ **Corvus Systems** (San Jose, CA) has announced the offering of 2,500,000 shares of common stock at a price of $13 per share by an underwriting group managed by Dean Witter Reynolds and Montgomery Securities. Net proceeds to the company from the sale will be used for repayment of bank debts, capital expenditures, and working capital. ▲



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BOARDS & BUSES

by Richard Kaapke

A person considering the purchase of a memory board for the IBM Personal Computer faces a confusing array of choices. This month we'll look at some (but not all) of the available memory boards, comparing what they offer and evaluating their special features.

The boards we'll cover this time are from IBM, Persyst, AST Research, Seattle Computer Products, and Chrislin Industries.

As you probably know, the Personal Computer uses *parity checking*; this is a feature that allows the computer's circuitry to test the validity of its memory operations and to report any failure to represent data accurately. All the memory products reviewed in this article include parity checking; a few of them allow you to disable the parity function, presumably so that you can continue using the memory board in the event a single memory chip fails. (What you would do in that case is replace the bad chip with one of the chips that's normally used to hold the parity bit, then disable parity and continue running.)

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Most of the memory products reviewed here (and most of the ones that are not covered in this article) allow for expansion. This means that you can start small (with 64K) and add more memory in 64K increments as the need arises. One product to be discussed shortly, the IBM 64K Memory Expansion Adapter, doesn't allow expansion in this fashion; you have to purchase additional adapters in order to increase your add-in memory. IBM's latest memory offering, however, is a 64K adapter that *can* be expanded. We'll get to this in a moment.

So that your computer can accommodate whatever number of memory boards you decide to put in it, all boards are *addressable*. That means you can specify a board to be, say, the third 64K of memory in the system—or any other numbered *bank* of 64K from the second to the eighth (the first 64K must be located on the pc's system board). IBM made a provision for 32K memory boards (a size that's been virtually ignored by consumers), so it's possible to locate many of the available memory boards on the odd-numbered 32K boundaries as well as on the even ones.

Is memory enough? For many people the answer is no. Consequently, most of the manufacturers whose products are reviewed here offer memory plus some additional interface or interfaces. The extra features included on these boards enable a single precious slot in your Personal Computer to serve many functions.

How much memory do you need? The answer depends on the work you plan to do. If you use *VisiCalc*, the more memory you have, the better off you are. With certain software products for the pc (the UCSD p-System, for instance), 128K is all you can use. Other products don't offer you any more once you get beyond 96K; these include Basic, DOS, and most programs written in Basic. Fortran, Cobol, and Pascal (the IBM Personal Computer Language Series) all run better in large memory systems, but it's not certain that they make use of memory beyond 256K.

On to the individual products. IBM itself is the first and obvious source many people look to. The company has two memory-expansion offerings: the 64K memory expansion adapter and the 64K-256K memory expansion adapter. The 64K adapter is simply that and nothing more. In the interest of more efficient slot utilization, IBM now offers the 64K-256K adapter, which allows you to expand from 64K to 256K as you need to. An IBM pc products dealer can sell this memory device loaded with any 64K multiple you like—64K, 128K, 192K, or 256K.

The Spectrum multiple-function memory card from Persyst allows you to have 64K-256K, plus optional add-ons of a parallel printer adapter and one or two asynchronous communications adapters. The parallel adapter can be "addressed" to act as a primary or secondary port, and the asynchronous adapters can be set to DTE mode or DCE mode (see Boards and Buses, November 1982), as well as having certain handshaking lines set in such a way as to minimize the number of wires required to connect to a peripheral. With

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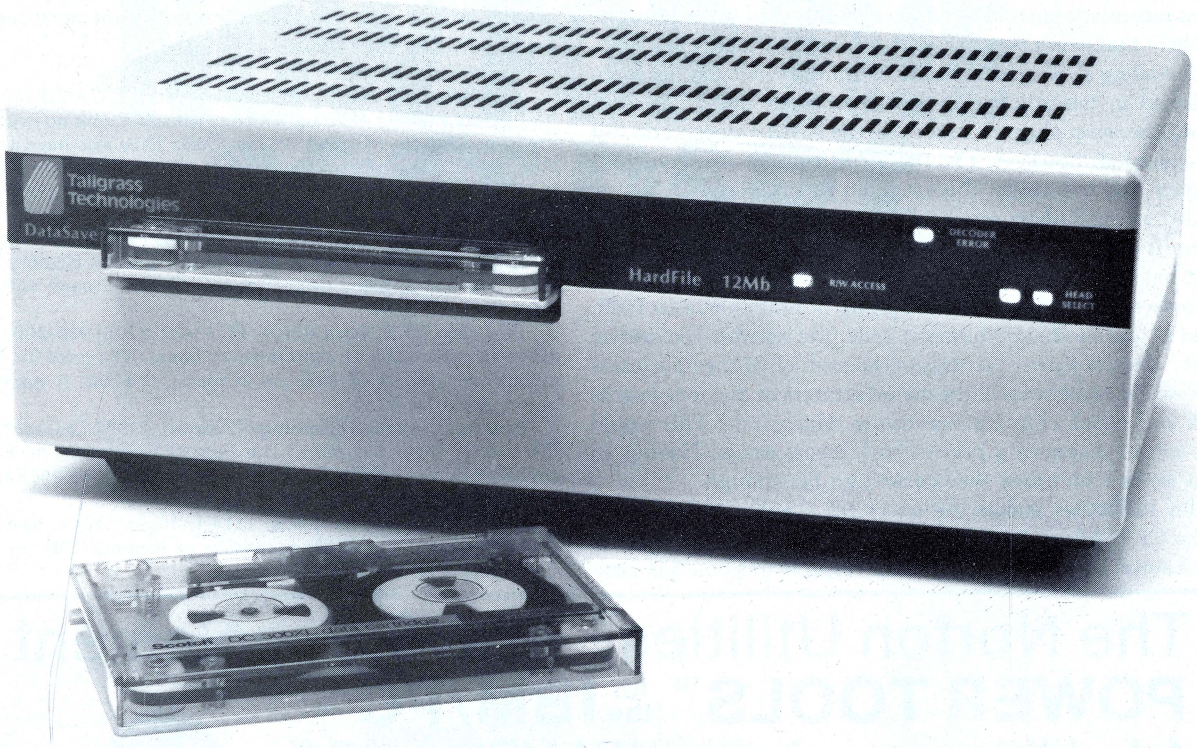

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the Spectrum card you can interface your computer with a parallel printer, a modem, and another serial device (a plotter, for example), *and* have 256K of memory—all at the expense of a single peripheral slot.

Does anyone really know what time it is? The AST Research ComboPlus board does. The ComboPlus offers 64K-256K, a parallel adapter, an asynchronous adapter, and a real-time clock (one that runs even when your computer's off). Included with this board is a disk with a program that lets you easily set the time and date on the built-in clock. The program also enables your pc to read the time and date on power-up or reboot, freeing you from having to type in this data for yourself.

The Seattle Computer Products RAM+ is a 64K-256K memory board with an addressable asynchronous adapter (usable as either a primary or secondary port). The adapter on this card is the only one reviewed here that won't pass the IBM Advanced Diagnostics without your installing a "wrap plug." All the other asynchronous adapters mentioned in this article have a self-test mode that allows testing without the wrap plug. The fact that the RAM+ doesn't do this is inconsequential, however. On the RAM+, both the asynchronous adapter and the parity checking can be disabled.

Included on the RAM+ are four LED indicators that light up if a parity error is detected, showing in which bank the error occurred. You must have the cover of your computer off to see these LEDs, and they only serve to indicate which group of nine chips is at fault. Since IBM's "parity-check" numeric code (the number the system displays if it detects a parity error) indicates which of the nine bits is at fault, it would make sense if the manufacturers of memory boards would tell you which chip corresponds to which code. This would make the job of diagnosing parity check errors easier. Having an LED light up is a nice idea that doesn't go far enough.

Chrislin Industries makes the CI-PCM, a 64K-256K memory board. The CI-PCM works well and is a good buy for people who want just a simple memory card. In most respects this board is similar to the IBM-produced board and to those "straight" memory cards made by AST Research and Persyst. The difference in the CI-PCM is one of size. The Chrislin CI-PCM fills the entire depth of the system cabinet. This memory may only be addressed in 64K bank segments; 32K boundaries can't be used as beginning addresses for this card.

When you're planning to buy a memory expansion board, it's important to keep in mind the future you envision for your computer. Thinking ahead can often allow you to make the best choice for the long run. If you see no present or future need for additional parallel or serial interfaces, for example, you can save money by buying a straight memory card. If you foresee the need for these additional functions, buy them. You'll most likely be glad not to have to give up slots for them later on; generally you'll also save money by buying an interface in conjunction with a memory card, rather than getting it on a separate card. ▲

AST Research, 2691 Richter Avenue, Irvine, CA 92714; (714) 540-1333. AST offers a family of straight memory boards, with no extra features, ranging from $395 for 64K to $795 for 256K. They also have a series of Combo Plus boards, for which you may select any or all of three options in addition to memory. The options are a serial port, a parallel port, and a real-time clock. Prices range from $495 to $995.

Chrislin Industries, 31352 Via Colinas, Westlake Village, CA 91362; (213) 991-2254. The Chrislin CI-PCM is a straight memory board. Price for 256K is $475. Chrislin also offers a CI-PCM+ board, with 512K and one serial port, for $895.

IBM, Box 1328, Boca Raton, FL 33432; (305) 998-2000. IBM currently offers an expandable straight memory board. The price for 64K is $475; additional increments of 64K are available at $200. A nonexpandable 64K board retails for $350.

Personal Systems Technology (Persyst), 22957 La Cadena, Laguna Hills, CA 92653; (714) 859-8871. The Persyst Spectrum Board offers four independently upgradable functions: memory (64K to 256K), a parallel port, and two serial ports. Call for prices.

Seattle Computer Products, 1114 Industry Drive, Seattle, WA 98188; (206) 575-1850. The RAM+ consists of memory (64K to 256K) plus one serial port. Call for prices.

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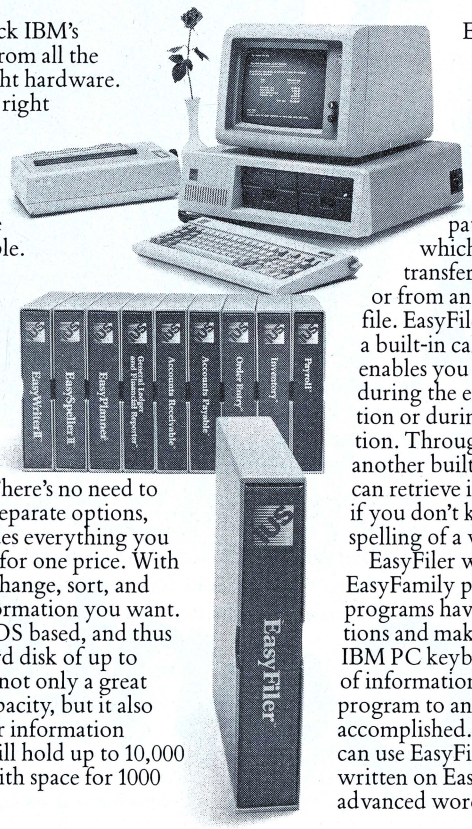

EasyFiler has a number of features which will help you increase the power and performance of your IBM PC. It is compatible with BASIC, which means you can transfer information to or from an IBM BASIC file. EasyFiler also includes a built-in calculator, which enables you to compute data during the entry of information or during report generation. Through "Soundex," another built-in feature, you can retrieve information even if you don't know the exact spelling of a word.

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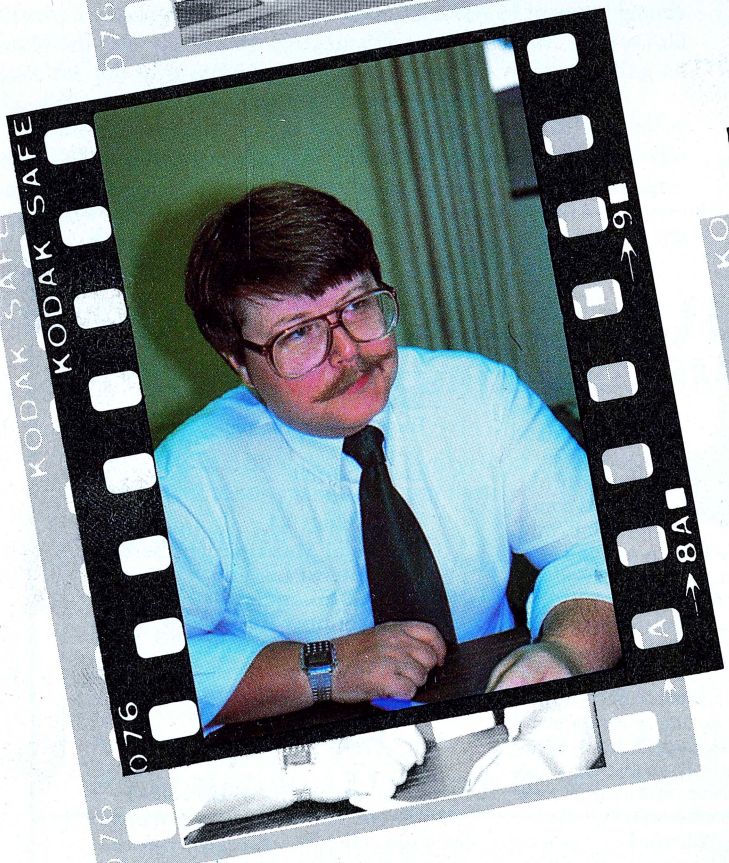


Exec Context:

The Software Synthesis

by Craig Stinson

Six months ago the tranquility of the IBM Personal Computer software market was rent by an item called *MBA*, which took an electronic spreadsheet, a database manager, a simple text processor, and a graphing module and bundled them into a single, integrated software tool. The package, which required no less than 256K of user memory, was arguably both the largest microcomputer program ever written and the first to make effective use of the pc's vast memory-addressing capability.

For its producers, Context Management Systems, *MBA* was also something of a gamble.

No one had ever tried to integrate so many separate functions into one program before. To be sure, a number of companies had developed families of programs that worked more or less harmoniously together. Software Arts had developed its Data Interchange Format, which had paved the way for Personal Software's metamorphosis into VisiCorp. Microsoft was at work on its Multi series, Information Unlimited on its Easy series, and so on. But the idea of a single program that would, say, transform spreadsheet data into bar charts at the stroke of a finger and update those charts just as quickly in response to changes on the spreadsheet—*that* had not been tried before.

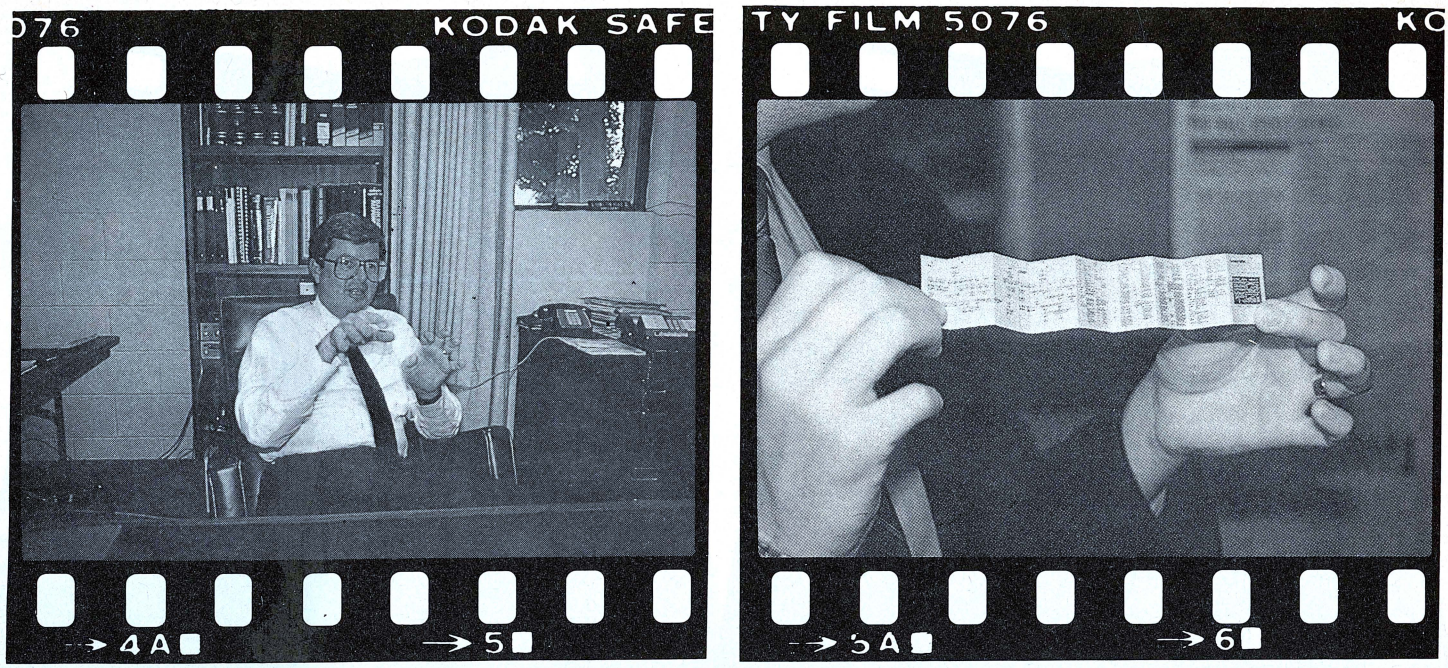
There was reason to wonder whether the thing would work—not so much whether the *MBA* could be made bug-free, but whether it was wise, from a performance standpoint, to throw so many separate kinds of functions into the same pot. Wouldn't that result in some fairly drastic reductions in the power of the individual modules? And wouldn't the end user, like a smart stereo buyer, prefer to buy components and take his chances with their possible incompatibilities, rather than go all in for a grab-bag of the unknown?

Then there was the matter of that 256K. Machines of that capacity may become commonplace in 1983, as the cost of memory comes down, but they were something of a stretch for the typical pc buyer in mid-1982. They were a stretch partly because, aside from *MBA*, there wasn't much reason to put 256K on a pc.

MBA, according to Context, was profitable in its first month of availability. It made the *Softalk* Top Thirty for the month of June and has been moving up steadily in the poll since then. Four months after the program's debut, Context announced that the market opportunity appeared greater than their most optimistic anticipations and that the firm was therefore accepting a million dollars in developmental capital from Brentwood Associates, a company that had previously funded such winners as Apple Computer and Fortune Computer Systems.

If drawing imitators is proof of success, then Context arrived in October. At that time, Lotus Development announced its introduction of a revolutionary new product, called *1-2-3*, that took an elec-

The Context management team. Opposite page, above: Gib Hoxie and Brian Fischer conceived MBA *and abandoned successful consulting careers to create it. This page: Jim Peterson is in charge of Context's software team, while Marty Mazner shepherds the marketing department. Opposite page, below: Jeff Walden is responsible for dealer training, and Mark Teitelman is the voice on the customer service line.*



Gib Hoxie, left, explains the features of MBA, *while Brian Fischer displays a reduced version of the program's command reference chart.*

tronic spreadsheet, a database manager, a simple text processor, and a graphing module and bundled them into a single, integrated software tool.

0-1-2 and Counting. To appreciate the gamble that was *MBA* in terms of human careers, you need to know a little about the two men most responsible for its creation and for the cofounding of Context Management Systems.

Gib Hoxie and Brian Fischer were not a couple of undergraduate wunderkinder taking their first steps into the business world. Hoxie (the "Gib" is a truncation of Gilbert) was a vice president and partner in the immensely prestigious consulting firm of Booz, Allen, and Hamilton. Walking away from a partnership at Booz Allen is a little like handing in the keys to Fort Knox. Fischer, who at twenty-eight is fifteen years younger than Hoxie, hadn't yet made it quite that far up the ranks at Booz Allen; nevertheless it seems reasonable to suppose that his future there was promising—and fraught with security.

But if Booz Allen was a high place from which to step down, it was also a vantage point that facilitated forward thinking and educated gambling.

Hoxie had spent the better part of the seventies pondering and wrestling with the problem of developing effective management information systems. Early in the seventies, Harvey Poppel, a senior vice president at Booz Allen, had begun promoting the concept of information as a corporate resource—like cash; and the Booz Allen staff had tried to encourage their major clients to think and act in those terms.

The translation of this concept into practical systems, however, proved to be elusive. "We found," recalls Hoxie, "that we were continually implementing *operating* information systems—such things as accounting and word processing—and not true *management* information systems."

The development of effective information systems for managers was difficult largely because the manager's function is by nature antisystematic. Or, to put it another way, those roles in a company's operation that lend themselves most readily to systematic procedures are precisely the ones that don't require managerial talent.

"A good manager is an exception handler," says Hoxie. "The other people handle routines. Our problem was to develop an information system for that kind of guy, one that would give him the ability to pull together disparate pieces of information, so he could find his own solutions to problems that hadn't come up before."

A couple of events that occurred toward the end of the decade convinced Hoxie and Fischer (who joined Booz Allen in 1978) that while elusive, the improvement of managerial productivity by means of electronic information technology was a realizable goal.

The first of these events was the Booz Allen Multi-Client Study of Managerial/Professional Productivity. This was a massive investigation into the behavior and attitudes of so-called knowledge workers in fifteen major business organizations. The study was orchestrated by Poppel and funded by most of the largest suppliers of office automation equipment (including IBM, AT&T, Xerox, DEC, Exxon, and a good many anonymous others) who were interested in quantifying the case for office automation products aimed at the managerial or professional worker.

Participants in the study each carried a beeper that went off every twenty minutes for three weeks of their professional lives. When the beepers beeped, the subjects pulled out a wallet full of forms on which they noted current activities and various other pertinent bits of information. Hoxie still keeps one of those wallets in his desk at Context.

When the study was finished, the Booz Allen staff evaluated millions of pieces of information and drew their conclusions. Among other things, they asserted that appropriate information technology could reclaim about 15 percent of a manager's time and that managers and professionals were by and large receptive to the prospect of office automation.

Paper Losses. The other crucial experience was a consulting assignment that took Fischer and Hoxie to the Pacific Northwest, to a kitchen cabinet-making division of International Paper. This division was doing $25 million in sales, had $17 million in inventory, and was losing about $600,000 a month.

This was in January of 1980. *VisiCalc* had been on the scene a little under half a year. Hoxie and Fischer brought along an Apple II and prepared a materials requirement planning model for the client, using *VisiCalc*. The model demonstrated, among other things, that the company could stop buying raw materials and not build anything until the end of the year, but that they'd have to hire 400 more people in June to prepare for the following year's production.

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The client threw Hoxie out of his chair, commandeered *VisiCalc* and the Apple, and spent the next three days knocking that model around, at the end of which time the general manager of the division laid off a hundred employees. That was the first step toward recovery; in six months the division reduced its inventory by half, went from $600,000 in the red per month to a break-even position, and finally was sold as a profitable division.

"I had been a consultant with Booz Allen for twelve years," Hoxie recalls. "Prior to that I'd been a systems guy at IBM for about five years; and I'd never seen any recommendation have that kind of impact."

Nothing Personal. Two months later Fischer and Hoxie paid a visit to Dan Fylstra, president of Personal Software, and tried to sell him a product strategy study for the development of *VisiCalc*. The study was, of course, the germ of *MBA*. Fylstra told them about DIF, which was then on the drawing boards (and still a year from its first appearance in the DOS 3.3 revise of Apple *VisiCalc*).

Fischer and Hoxie thought DIF sounded inadequate as a tool for integrating software functions and tried to persuade Fylstra that they had a better idea. Looking back, Fischer says he can't blame Fylstra for turning them down. "He was just too preoccupied with other matters to seriously consider buying a product strategy study from a couple of guys he didn't know. We understand that; if somebody came in here today and tried to sell us a product strategy study, we'd be tempted to throw him out," he says. "But we wouldn't do it."

After losing that sale to Fylstra, the two men drove out of Personal Software's Sunnyvale offices, headed up the coast to San Francisco, and checked into the Hyatt Regency; by dawn they had a business plan.

Context Management Systems was incorporated in October 1980. Hoxie left Booz Allen in December of that year, and Fischer followed in February. The following month they hired their first employee, Jim Peterson, as vice president of product development. Peterson, who had designed integrated circuits for TRW before coming to Context and who had, along the way, picked up three hardware patents, became the programming honcho for microcomputerdom's biggest software project.

Actually, Peterson wasn't the only member of the team who had extensive hardware experience. Fischer had spent vacations from MIT designing microprocessors for Fairchild and had helped develop Fairchild's first CMOS chip. Knowing that their concept for *MBA* necessitated hardware horsepower well in excess of what was generally available in 1981, the trio considered building their own machine to run the program. "We abandoned that idea after three weeks," says Fischer, "because we figured whatever we did in hardware somebody else could do as well."

By April the walls of Hoxie's living room were covered with flow charts and other design paraphernalia. The group took an office in Torrance, California, and began the actual coding of *MBA* that June.

About the same time they picked up and marketed an entirely different product. "None of us had a consumer products background," Hoxie relates. "We knew we were vulnerable in that area, so we acquired the rights to distribute *The Connector*, which had been developed by a couple of guys at Booz Allen. We cleaned it up and brought it out in June of '81, with the principal objective of learning how to market a consumer product."

The Connector was a program that downloaded data from remote databases and converted it into *VisiCalc* files for the Apple II. It was not an overpowering commercial success, although Hoxie asserts that it sold more than they expected it to.

"We learned a little bit about package design," he recalls. "And we learned how hard it was to do good documentation."

The Connector also connected Context to Martin Mazner, who subsequently joined the firm as marketing vice president. Mazner, after a decade in advertising, had cofounded in 1980 the magazine *Computer Merchandising*. When the magazine was forced to accept venture capital, Mazner decided he didn't want to work for someone else, flipped a coin with his partner, and sold his interest.

A stint of consulting brought him into contact with Context. Mazner says, "I told them what they were doing wrong with *The Connector*, so they offered me a job." He turned it down.

In the fall of 1981, Mazner did go to work for Context, becoming the architect of the company's marketing strategy for *MBA*. That strategy was aimed at ensuring an unprecedented degree of retailer support for a product of unprecedented complexity. Every dealer authorized to sell *MBA* has to have completed a training program given by the Context staff and has to sign an agreement to provide buyers with any necessary follow-up support. *MBA* is now available in 190 stores.

Taking Chances. This marketing approach is another in a series of calculated risks on Context's part. Mazner acknowledges that the company could have sold "several times as many *MBA*s" had they chosen to make the program available through a large wholesaler, such as Softsel. But they believe that maintaining firmer control over the dealer-user transaction will pay off when and where it matters—in the long run and with the Fortune 2000 clientele that Context considers to be its primary marketplace.

The company isn't expecting dealers to be the sole source of user support. Mark Teitelman at Context provides a telephone hotline service and tabulates users' requests and suggestions. An *MBA* template publishing service and a newsletter on disk are in the works. Jeff Walden, who arrived at Context recently by way of VisiCorp, is responsible for the maintenance and furtherance of dealer education.

It'll be an ongoing effort. Context is committed to twice-annual updates of *MBA*. Version 2, scheduled for release this December, will include telecommunications, a module for forms generation, and more powerful word processing features. An interim update, offering mainly speed enhancements, was scheduled for display at Comdex in late November.

Hoxie and Fischer stress the importance of telecommunications to the concept of *MBA* as a comprehensive management tool. They also hope that communications capability will help overcome some of the remaining bastions of resistance among computing professionals to the personal computer.

"The corporate MIS guy sees the microcomputer as a potential mole," says Hoxie, referring to the fear expressed in some quarters that desktop computers will lead individual managers to build models based on incomplete or biased assumptions. With *MBA*, he asserts, a company can maintain control over its information resources and offer managers—on their own computers—authentic, qualified data on which to base projections.

With regard to the future of *MBA* beyond version 2, Context is mum. A version 3, features unannounced, is promised for the spring. The program is coded in UCSD Pascal, partly for the sake of portability (by spring, Context expects to have it running on three other computers in addition to the IBM) but also for the sake of maintainability. Hoxie and Fischer speak of *MBA* as a "living product," one that will expand and keep pace with changes in the relevant technologies.

Wherever they take it—and themselves—one may presume that the effort will be guided by a couple of crucial navigational aids: an uncommon awareness of computer technology and the uses thereof, and a willingness to take chances based on that awareness. ▲

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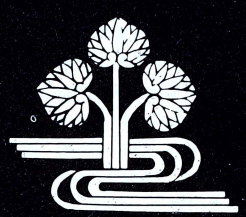

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newspeak

Δ **Christmas in August?** American Express likes to do nice things for their customers. When innovative new ideas surface, this company tries to give customers a preview glimpse. In May, they were the first to have the Sinclair handheld computer. Late this summer American Express mailed to cardholders what are best described as "electronic greeting cards."

An electronic greeting card looks like any other greeting card at first. It's only when you open it that the difference becomes apparent. The card offered by American Express plays a two-song medley of "We Wish You a Merry Christmas" and "Silent Night."

Utilizing a CMOS-LSI chip, a button-sized battery, and piezo-electric transducer for a speaker, this new breed of greeting card is a logical follow-up to watches and calculators that play musical tones. A simple contact switch causes the music to play when you open the card. Closing the card sets the program back to the beginning. The eighth-inch thick battery provides up to eight hours of continuous play.

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Stan Krangel, a merchant in American Express's New York office, says the cards have been very successful and have generated a lot of interest among those lucky enough to see one. "We figured that people were going to be real curious about how the cards worked. So we decided to include a brief missive explaining how they function."

At this time only customers of American Express can get these musical cards, though that will change in the future.

American Greetings is currently working on a whole line of electronic greeting cards that should be appearing sometime this spring. Twelve different cards are on the docket, including six that play "Happy Birthday." There will also be five friendship cards that play such tunes as "These Are a Few of My Favorite Things" and "Let Me Call You Sweetheart."

According to a recent *Los Angeles Times* article, Hallmark Cards Inc. has also been examining the potential of microcomputer-aided greeting cards. Meanwhile, American Express is now looking at other possible marketing applications for microchip technology. The next innovation may be talking cards that electronically whisper words of endearment to your loved one.

Δ **Corporate Convenience Stores.** American business is striving to adjust to the personal computing revolution. A growing corporate trend is to establish a staff-only microcomputer center, managed by personnel from the data processing department. Stocked with desktop machines that the company acquires at a quantity discount from area stores, the center sells machines to employees at the same discount.

Take the curious case of Boston's First National Bank, for instance. William R. Synnott, head of the information systems and services division, was quick to spot both the potential and the possible hazards of widespread personal computer use in a large institution of high finance. If employees were going to buy and use micros on-site or at home, it seemed like a good idea to have the bank involved.

"We sought management support for the idea that our division should be given responsibility for controlling the growth of microcomputer usage throughout the organization, under the aegis of a personal computer center" says Synnott. "It would function as both a store and a laboratory, where managers could come in and use the machines by appointment for getting help in solving business problems as well as instruction on the use of popular software programs like *VisiCalc*."

A manager can borrow a computer, try it out, and buy it at the 20 percent discount the bank receives from Boston area stores. First National is not, however, a computer retailer in the normal sense. Employees who wish to buy a machine must complete a form stating the use to which they intend to put it and why they need to take it from the center. In this way, Synnott's information division keeps tabs on who's got what and why. It's like registering a gun. The company knows you have it, and if something bad happens they know where to start looking.

"If they want it for a use that will affect the books, we refer them to the auditor for approval. If they want to access a corporate database, we refer them to the purveyors of that database and to the bank's security officer for approval."

Training at the personal computer center is provided by the information systems staff, who work the center on a rotating basis. Full-time staffers alternate with half-day volunteers as consultants. The most popular computer at First National is the Apple ("it has the most software"), followed by the IBM Personal Computer ("coming on strong"), with the TRS-80 in third place.

The center has a software library, which Synnott encourages employees to add to.

"If people in the bank develop software that we think has universal appeal, we will include it in the library after testing. One employee is currently developing a 'Monte Carlo' simulation program to analyze oil and real estate investments. Most programs developed are of the *VisiCalc* variety, from telestaffing models to asset liability management, financial analysis, loan analysis, portfolio management, tax planning, stock performance, and statistical modeling.

"We just teach them how to use the machines and give them some training in *VisiCalc*, but we don't write their programs. This is a do-it-yourself business."

Δ **Ready, Aim, Ignite!** Suppose you're a nurse who works nights on the sixth floor of a hospital. It's dangerous at night on the street where your car is parked. It's also cold out there.

So when you're about ready to leave, you pull out a transmitter, as small as a pack of cigarettes, with a seven-inch antenna. Aiming the transmitter through a window in the direction of your car, you push a button. The motor starts, the heater turns on, and then the headlights come to life. Five minutes later you exit the hospital, get in the

warmed-up car, and drive away in comfort.

Except that by the time you get to your car, a crowd has gathered and wants to know where you got the gizmo that made the car start unattended.

The little black box is called TransStart, and it's part of a system made by TransStart of Provo, Utah. It retails for less than $400. For an additional $100 you can have the whole kit professionally installed.

The entire system consists of the transmitter, a two-by-four-by-six-inch receiver that attaches under the dash of your car, and solenoids that attach to the starter and any other electrical device you want turned on automatically. To prevent the device from affecting your neighbor's car, if it also happens to have TransStart installed, each system has a personal frequency code that programs one system only.

When you push the button on the transmitter, the microcomputer in the receiver under the dash activates the starter, sends back a message that it has started, then kicks out eight seconds later. It lets the car run eight minutes before turning it off unless it receives further instructions. That way, in case you are delayed in leaving, you don't waste gas while your car sits idling without a driver.

The mind of man always seems to be racing ahead of what technology can actually do. In the case of Gene Thall, coinventor of TransStart, the idea had a twenty-year lead on its realization.

Back in 1958, Thall thought there's got to be a better way to start your car than running out to it, getting in, and starting it cold, especially on winter mornings.

"I was born and raised in Wyoming, and it gets awfully cold there," he says. "Sometimes it'll reach thirty below and stay there for six weeks."

So Thall and his son, Steve, began to formulate a system to start a car by remote control back when a gallon of gas cost less than a copy of a big city newpaper does today.

"The theory was strong, but we had to make it work," says Thall. The idea was eventually knocked out of their minds: no suitable technology existed at the time.

The notion remained parked in the back of the tinkerers' minds for twenty years, until 1978, the year the proper chips and diodes reached the marketplace. Thall and son hauled out their sketches and brought their starter into the microcomputer age.

"We put together a rough prototype and made it work on a Dodge pickup. That's when we decided to have a go at the thing full time," Thall explains. "We hired some engineers and set up shop."

So far TransStart has marketed about seven thousand of the units in the western states and they're "moving east," says Thall. "It's available mostly through car dealerships right now."

The success of the auto starter has inspired TransStart to investigate new products, according to Thall. "Mostly items no one has heard of." Let's hope the Thalls won't have to wait twenty years between the idea and the execution of the next gizmo their imaginations cook up.

Δ **CompuScam.** The personal computing world, though still young, innocent, and excitable, is subject to all the thousand shocks that flesh is heir to. As yet, it still counts first-time users and very young people, rather than seasoned business users, among the greater portion of its population. All the openness and enthusiasm that characterizes this world makes it particularly vulnerable to the speculation of less-than-scrupulous individuals.

He calls you on the phone, or knocks on your door, or comes to your office. He's a businessman with a problem. He says he's just purchased a quantity of Apples/IBMs/modems/printers/disk drives. His clients have put down a 50 percent deposit, but now they can't come up with the rest and he's stuck. If you move fast, you can take a lot of valuable equipment off his hands at half price. Just give him $1,200 to $1,800 per batch of five units, and he'll use it to pay off his distributor, saving two or three machines for you.

You do so. After some time has elapsed, you give him a call. There's been a delay; the items were misrouted. More time passes. Now the man reveals that the manufacturer is checking to see if the equipment is stolen goods. Months go by. And suddenly your entrepreneurial partner is nowhere to be found.

This may have happened to you, or it may in the future. And the man's name may be William Bozarth.

Bozarth faces charges of felony grand theft and falsely representing an Apple dealer in the California counties of Santa Cruz, Solano, Marin, Concord, and Monterey. His case has produced so many jurisdictional problems that the five counties are considering turning the matter over to the California state attorney-general's office. If you have any information about Mr. Bozarth, contact the district attorney's office of any of these counties.

The ability of the native American bunco artist—the gentleman who once sold deeds for the Brooklyn Bridge to arriving immigrants—to adapt to sophisticated technology is a matter of record. In the recent case of the fictitious Arizona World Enterprises company, the individual responsible was finally caught, tried, and convicted. He subsequently moved to a neighboring city and pulled the same scam again.

The advent of the computer age has failed to render obsolete the oldest tenet of business: *caveat emptor*—let the buyer beware. ▲

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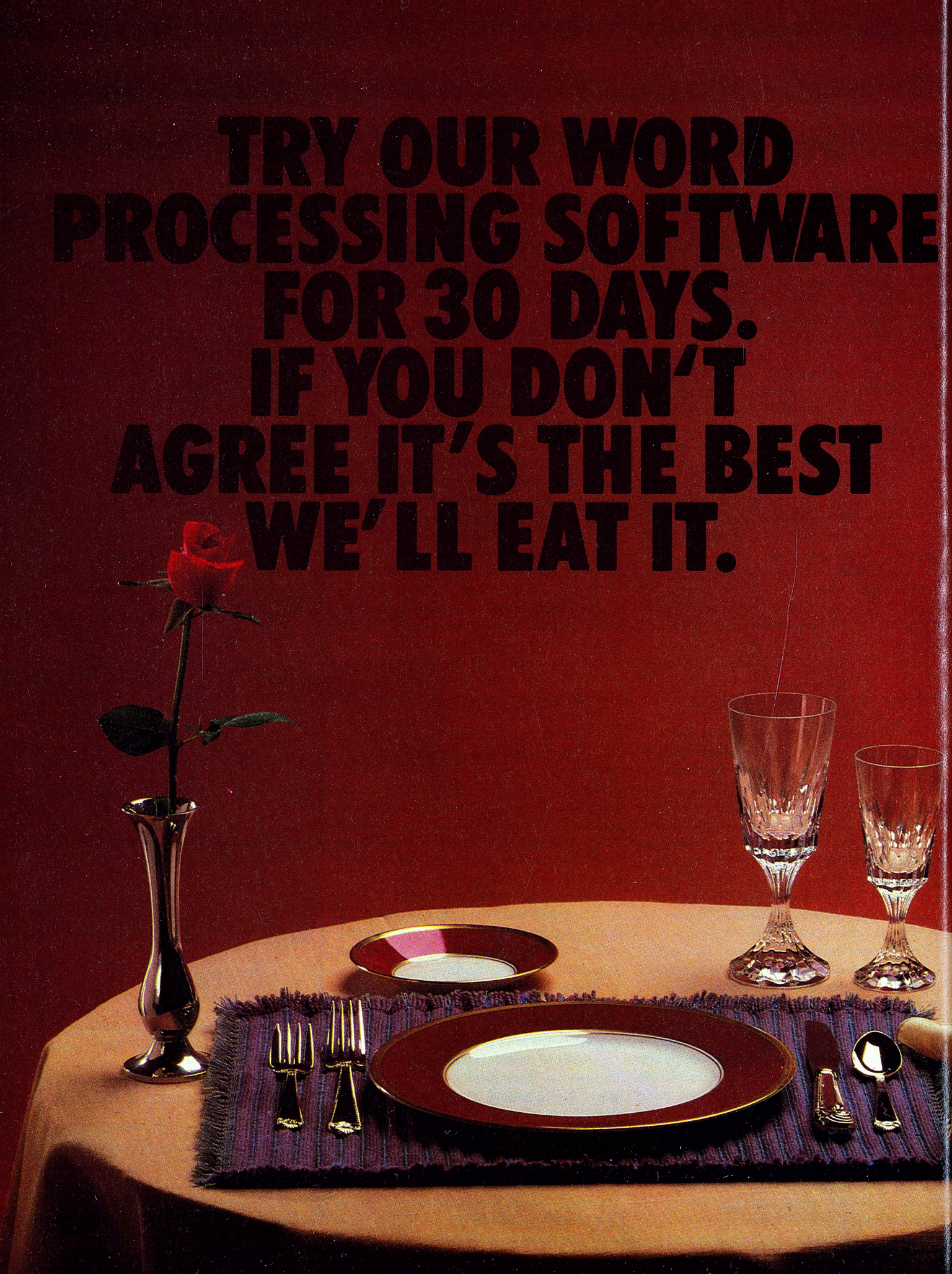

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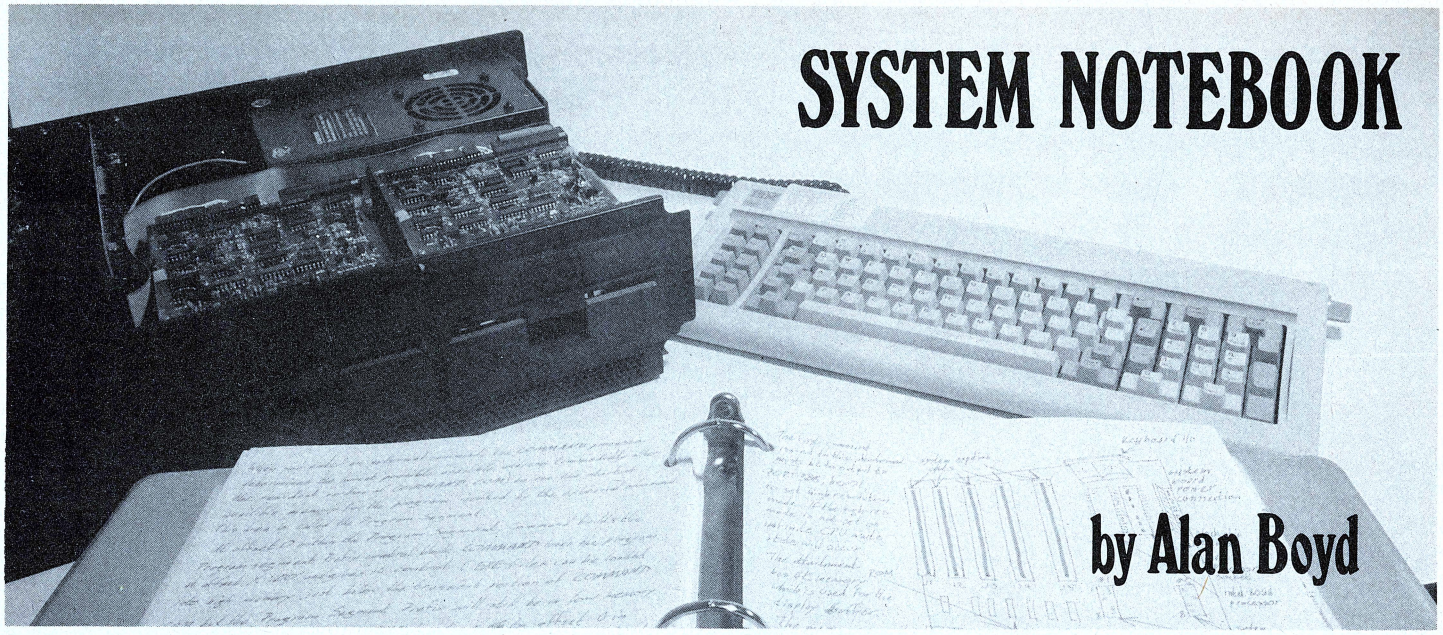


SYSTEM NOTEBOOK

by Alan Boyd

Over the past six months we've seen in detail how to work with almost all of the DOS commands in versions 1.0 and 1.1 of the operating system. This month we'll take a close look at one of the remaining commands—*mode*.

This is one of the more obscure commands in the system. Not everyone needs to understand or even acknowledge the existence of this command, but as you become more proficient at using your pc, you'll undoubtedly run into a situation where you'll find *mode* handy—particularly when it comes time to expand your pc beyond its present capabilities.

Mode exists in two different flavors, depending on which version of DOS you have. Many users of DOS 1.0 reported problems with *mode*, so version 1.1 of the operating system sported a new, enhanced *mode* command, one that offered many new and desirable features and included everything that had been available on the earlier version. We'll restrict this discussion to *mode* as it exists in DOS 1.1.

Mode, an external DOS command residing on the master disk, is designed specifically for use in configuring peripheral equipment. It actually has several rather distinct uses, and we'll get into each of them momentarily; but first we should digress long enough to define and discuss the concept of peripheral equipment.

The term *peripheral* is a general one denoting any external equipment that can be attached to the pc. Generally such equipment interfaces through one of the card slots inside the computer. Any of the devices attached to the pc through a slot can be thought of as a peripheral. This, of course, includes memory cards, video interface cards, disk controllers, and the like—although these devices are so integral to the system that they're seldom referred to as peripherals.

The Outside Inside. The most general of all peripherals is the printer; other examples include modems, graphics digitizers (also called bit pads), analog controllers, speech synthesizers, mechanical arms, music synthesizers, pen plotters, and joysticks. Usually, the use of the computer for any so-called real-world application requires the addition of one or more of these peripherals.

Many people quickly discover that the pc can be molded into a very effective word processor simply by the addition of word processing software and a printer. In fact, many of the popular "dedicated" word processing machines are actually microcomputers, and internally some of them closely resemble the pc. All of which really means that the term *word processor* has become more of a way of describing the position in the market taken by the manufacturer rather than the capabilities of the machine.

Many "word processor" manufacturers are now offering computational abilities in software as an adjunct to the word processing software that their machines were originally shipped with; this is not the result of any technological breakthrough, but rather a reaction to today's increasingly sophisticated consumer market. Similarly, many manufacturers of personal computers are now offering word processing software packages along with their personal computers. Both the preceding statements apply to IBM, among other companies. You can now do general-purpose computing on their dedicated word processing machines, and, of course, you can use your pc as a powerful word processing machine.

In order for a word processor to be effective, a printer must be added to the basic computer system. There are essentially two types of printers on the market, the dot-matrix type and the letter-quality type. There are also two methods of interfacing these printers to the pc—through a serial interface or through a parallel interface.

The IBM printer, which is actually manufactured by Epson, is a dot-matrix parallel printer, whereas most of the letter-quality printers from companies such as Nippon Electric (NEC) and Diablo are serial.

The difference between a dot-matrix printer and a letter-quality printer is self-evident, although the difference between a serial interface and a parallel interface is not—and is not well understood by the average personal computer user. The difference lies in the number of bits of information transmitted at one time.

Interfacial Bits. In a parallel interface the computer sends information across eight parallel wires. This setup makes it possible to transmit eight bits at a time. A serial interface sends information serially, or one bit at a time. Obviously, the parallel method is faster, since it can send eight bits at once. However, the serial method is more common.

There are two reasons for this apparent anomaly. The first is that few computers use a standard parallel interface, whereas most computers have an interface card that allows use of the RS232-C serial standard. Also, because of the nature of the circuitry required, serial lines can be run significantly longer than their corresponding parallel cousins—which means that noisy serial peripherals can be placed in a room away from the computer.

Therefore many peripheral equipment manufacturers offer the serial interface as a means of communication. This allows the use of their equipment on a large number of different computers.

IBM offers what they call an Asynchronous Communications Adapter, which is actually an RS232-C serial interface card. The purpose of this card, obviously, is to interface the pc to any of the generic peripherals that are available on the market. IBM does not

currently offer a serial letter-quality printer, so information on how to attach such a device is sketchy in the IBM literature.

The actual physical hookup is usually trivial, since most devices use standard connectors. On the other hand, the software modifications necessary to make a serial printer work with DOS are not so obvious. DOS is naturally configured to talk to a parallel printer (probably since that's what IBM sells), although a simple command can redirect the printer output to a serial device. This command is *mode*.

In DOS 1.0 the syntax model for the *mode* command was

MODE [LPT#:] [,n] [,m] [,T)

where the square brackets enclose optional parameters. This form of *mode* was replaced by a somewhat more elaborate version in DOS 1.1. The new *mode* command actually has four different and distinct "modes" itself and is one of the most complex of all DOS commands.

The first use for the command is in setting up a printer for different line spacings and characters per line. In this use the command takes the format

MODE LPT#:[n][,m]

Again, the square brackets enclose optional parameters. The variables are

 # the printer number—either 1, 2, or 3
n the number of characters per line—either 80 or 132
m the number of lines per inch—either 6 or 8

The printer number allows the system to have more than one printer. For example, many people have both a dot-matrix parallel printer, which they use for rough drafts of documents or graphics representations, and a letter-quality printer that they use for final copies. DOS actually allows up to three such devices, which is really overkill.

Use of the *mode* command for this purpose is easy. For example, if you wished to change the number of characters per line from 80 to 132 and the line density from six lines per inch to eight lines per inch, you'd issue the command

MODE LPT1:132,8

DOS would then respond with the following messages:

Resident portion of MODE loaded
LPT1: not redirected
LPT1: set for 132
Printer lines per inch set

all of which indicate that the necessary adjustments have been made. (We'll come back to the "not redirected" message shortly; right now it's inconsequential, because it is just telling us that no changes were made.)

When you first turn on the pc, the default condition for printer parameters is eighty characters per line and six lines per inch. You should only use the *mode* command in this context if you wish to change these to some other settings. The MX-80 printer, which IBM calls their 80 CPS Dot-Matrix Printer, is actually capable of printing in two modes, 80-column and 132-column, and two line densities—six lines per inch and eight lines per inch.

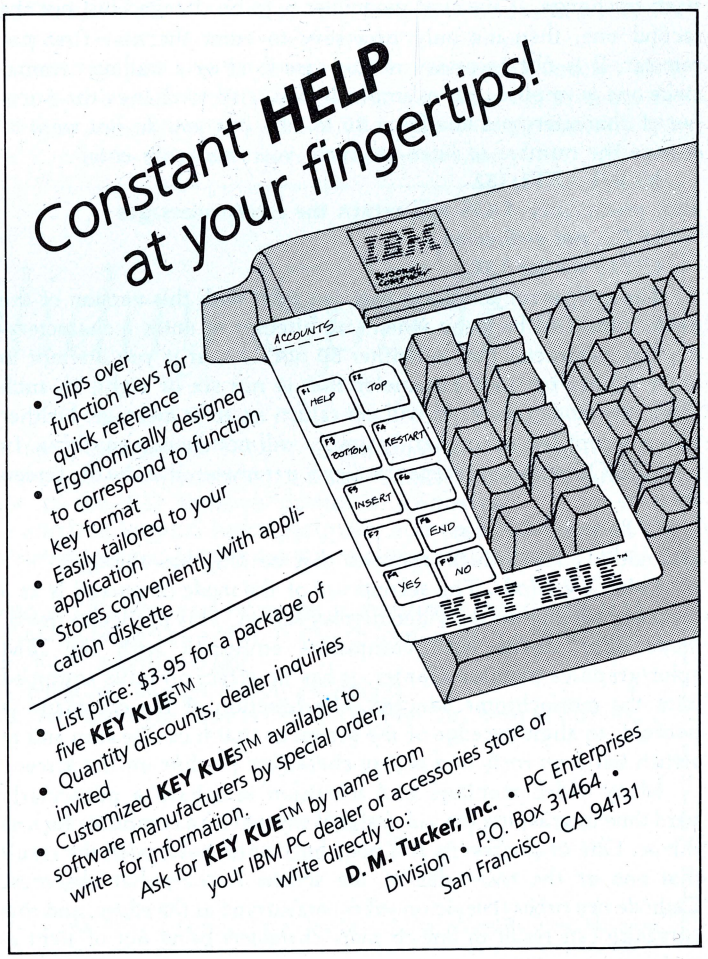
When you issue the *mode* command to change the default setting from 80 characters per line to 132 characters per line, the pc reinitializes the printer and enables it to print in the condensed format. This is particularly handy for printing on 8½ by 11 paper the sort of wide reports that are normally printed on 132-column printer paper.

Many word processors do not allow text to be output to a printer in a format wider than eighty columns. This capability of DOS and the MX-80 printer provides a convenient way to circumvent such a limitation. Since your CRT displays only eighty characters on a line, a word processor would need to be able to scroll horizontally as well as vertically if it were to format on screen lines of more than eighty characters.

DOS includes a mini line editor that enables you to key and modify entries into the command line interpreter. This is the editor you would normally use to issue commands to DOS. Very conveniently, this editor also permits up to 128 characters to be entered on a logical line (that is, on what DOS internally recognizes to be a single line). Of course, the logical line cannot be displayed as a single line on the video screen. After eighty columns (actually seventy-eight, in most cases, since DOS requires two characters for its prompt), DOS automatically scrolls down to the next physical line and continues there. Once you reach the 128th character, DOS beeps the bell and refuses to allow any more characters to be entered—with the exception of the enter key (and a few control characters that either backspace, cancel the line, or have the same effect as hitting the enter key).

Typing Letters on the Fly. The fact that DOS permits a logical line of 128 characters gives you a very cheap and dirty method of typing letters, since you can create a file on the fly by means of the *copy con: filename* procedure and then print it by typing control-PrtSc and then issuing the command *type filename*. This method of sending text to the printer will work in either the 80-column or the 132-column format, although DOS's limit of 128 characters per line will prevent you from taking full advantage of the printer's 132-column capability.

One pitfall to watch for is the fact that if you type characters into a file using *copy con:* and you go past the eightieth column without entering a carriage return, DOS will appear to provide a carriage return for you. It only does this for the sake of appearance on screen, however, and if you try to print such a file in eighty-column mode, the printer, after printing the first eighty characters, will do a carriage return *without* a line feed. The net result will be that it will overprint the characters at the beginning of the line until it encounters the carriage return that you actually entered on screen. If you commit this oversight, don't despair. Simply change the printer



mode to 132 columns.

If you prefer using the printer in 132-column mode (or condensed print mode, as it is known) all of the time, then it is probably best to set up your DOS disks with an Autoexec.bat file that automatically initializes and adjusts the printer for you whenever you turn on your system. For example, if you wanted to have the printer automatically come up ready to print 132 characters per line and eight lines per inch, then you could create the Autoexec.bat file:

```
REM This is the Autoexec.bat file to initialize the printer
REM for 132 columns per line, 8 lines per inch
MODE LPT1:132,8
REM Don't forget to get the date and time
DATE
TIME
^Z
```

As is the case with most DOS commands that require you to enter parameters after the command, *mode* does not require that you enter all the parameters. If, however, you wish to change the second parameter only, leaving the first as it is, you need to issue a comma before the second parameter. For example, to change the line density from six to eight while leaving the printer in eighty-column mode, you'd enter the command

```
MODE LPT1: ,8
```

(the space before the comma is optional). In this case, DOS will reply with the screen messages

```
LPT1: not redirected
Printer lines per inch set
```

The only difference between this and the reply to the full command used earlier is that this one doesn't say "LPT1:+1 set for 132"; it doesn't need to since you haven't made any change to the width parameter.

Obviously, the comma before the second parameter is the only way to describe accurately to DOS which parameter it is that you wish to change. If the first parameter is to be changed but not the second one, then it's only necessary to enter the new first parameter. It is not necessary in this case to enter a trailing comma, since one is implied. For example, if you wish to change the number of characters per line from 80 to 132, but you do not want to change the number of lines per inch, you need only enter

```
MODE LPT1:132
```

and, predictably, DOS will return the screen messages

```
LPT1: not redirected
LPT1: set for 132
```

The only error condition that can exist with this version of the *mode* command happens when you attempt to enter a characters-per-line parameter that is neither 80 nor 132, or if you attempt to enter a lines-per-inch parameter that is not six or eight. In such cases, the *mode* command will *not* return an error message. Neither will it accept the parameter. It simply will not change anything. In fact, if DOS does not accept the illegal parameter, it emits the screen message

```
LPT1 not redirected
```

and nothing else, which indicates that nothing has changed.

Color TV Mode. The second use of the *mode* command is as a means of setting up the video display screen. This particular use of *mode* only works with computers equipped with the IBM color/graphics monitor adapter; it has no effect on units equipped with the monochrome adapter. The function of the command is twofold: to align the edge of the screen so that it can be seen and to switch between forty and eighty characters per line on the screen.

Many video monitors and television sets have a particularly hard time in grasping the video signal emitted by a computer such as the pc. One of the results is a poor horizontal hold, with the result that one of the two sides of the screen is somewhat obscured. Cathode ray tubes (television tubes) are curved at the edges, and this curvature can result in one or more characters being out of sight at the corners of the screen. When you try to correct this by adjusting the horizontal hold on the monitor or television, you will sometimes lose the picture completely.

This use of the *mode* command has a different syntax structure from the first use we saw. This essentially makes it a different command with a completely different function. The syntax model in this is

```
MODE [n][,m][,T]
```

where *n* is the number of characters per screen line (either forty or eighty), *m* is either R or L and specifies the direction you want to shift the display, and *T* is an optional request for a simple test pattern to aid in the alignment of the screen.

Of course, the same rules for omitted parameters apply to this version of *mode* as to the first that we saw. If parameters are not to be changed, then a comma needs to be entered in the command line—unless the only parameter changed is the first one—or both of the first two.

For example, if you want to change the screen mode from eighty to forty columns then you should enter the command

```
MODE 40
```

This causes the screen to go blank and all characters to be enlarged in the horizontal direction to twice their normal size. To see the effect, enter the command just given and then issue a *dir* command. The forty-column display is particularly suitable for the pc with a television and an RF modulator, since most televisions don't have sufficient resolution to display eighty characters on a line legibly.

The second parameter in this command is either an R or an L; obviously these letters stand for *right* and *left*. This parameter is a signal to DOS to shift the entire display a fixed increment in one direction or the other. For example, if you wished to reset the screen to eighty-column mode and shift it to the right, you'd enter the following:

```
MODE 80,R
```

This would cause the screen to go blank and the entire field of view to be moved over the equivalent of two character positions. If we had left the screen in forty-column mode, it would have moved over by the equivalent of one forty-column character.

If the display is still not far enough over to the right, we can simply move it over one more increment by entering

```
MODE ,R
```

If it is too far over we could move it back by entering

```
MODE ,L
```

The final parameter is a request for a test pattern that can be used for alignment purposes. The test pattern is simply a line of numbers across the top of the display. You would request the test pattern by issuing a command something like

```
MODE 80,R,T
```

DOS would print the line of characters—in this case in eighty-column mode—and then prompt

```
Do you see the leftmost 0? (Y/N)
```

If the leftmost 0 is clearly visible, press the Y key. If not, press the N and DOS will adjust the screen and continue displaying the prompt until you have it set just right.

Of course, if you type the command

```
MODE 80,L,T
```

DOS will do exactly the same thing, but it will move the display to the left rather than the right.

If you're having alignment problems with your monitor or television set, it's worthwhile to run through this exercise once to find out how many times you need to move the screen to get its most acceptable position; then you can use that information to build an Autoexec.bat so that the display can be reset automatically every time you turn on the system.

For example, if you found that you needed to move the screen two increments to the right in order to see the whole picture, you could build an Autoexec.bat file that would set it up correctly every-

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e format in which the information is sent
ay know, alphanumeric characters can be
bit patterns, known as ASCII codes (for
for Information Interchange). ASCII is
ie glaring exception—IBM's larger com-

ronization is best illustrated by way of an
anted to send the simple string "ABC"
line. The ASCII codes for these charac-

hese characters is represented by a unique pattern of seven bits (binary digits). To communicate these characters, we could simply send out the binary string

100000110000101000011

which does accurately represent the three characters. However, this doesn't make much sense at the receiving end, since the receiving computer doesn't know, and can't tell, where the representation of each character starts and stops. To pass this information across, the concepts of *start bits* and *stop bits* were introduced.

Start bits and stop bits are used to frame each character. Most systems use an arrangement whereby one start bit precedes the character and one or two stop bits follow it. Assuming two stop bits, our transmission would take on this appearance:

Each of these terms relates directly to general data communications and will be encountered many times when you're dealing with any type of interface—whether it be to a printer or over a telephone line to a remote host computer. To understand each of these terms a superficial knowledge of the methods of data communication is required.

The issues are best visualized in the context of communications over a telephone line. A telephone line is a good example of a serial interface. There is only one line between any two communications points, so that data must be sent in a serial fashion.

The method that has been standardized and accepted by the Bell system is the one whereby bits of information (either zeros or ones)

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If you prefer using the printer in 132 densed print mode, as it is known) all of the best to set up your DOS disks with an Au matically initializes and adjusts the printe turn on your system. For example, if you w automatically come up ready to print 132 eight lines per inch, then you could creat

```
REM This is the Autoexec.bat file to i
REM for 132 columns per line, 8 lines
MODE LPT1:132,8
REM Don't forget to get the date and
DATE
TIME
^Z
```

As is the case with most DOS comma enter parameters after the command, *mod* you enter all the parameters. If, however, second parameter only, leaving the first as comma before the second parameter. For ex density from six to eight while leaving the p mode, you'd enter the command

MODE LPT1: ,8

(the space before the comma is optional). reply with the screen messages

LPT1: not redirected
Printer lines per inch set

The only difference between this and the reply to the full command used earlier is that this one doesn't say "LPT1:+1 set for 132"; it doesn't need to since you haven't made any change to the width parameter.

Obviously, the comma before the second parameter is the only way to describe accurately to DOS which parameter it is that you wish to change. If the first parameter is to be changed but not the second one, then it's only necessary to enter the new first parameter. It is not necessary in this case to enter a trailing comma, since one is implied. For example, if you wish to change the number of characters per line from 80 to 132, but you do not want to change the number of lines per inch, you need only enter

MODE LPT1:132

and, predictably, DOS will return the screen messages

LPT1: not redirected
LPT1: set for 132

The only error condition that can exist with this version of the *mode* command happens when you attempt to enter a characters-per-line parameter that is neither 80 nor 132, or if you attempt to enter a lines-per-inch parameter that is not six or eight. In such cases, the *mode* command will *not* return an error message. Neither will it accept the parameter. It simply will not change anything. In fact, if DOS does not accept the illegal parameter, it emits the screen message

LPT1 not redirected

and nothing else, which indicates that nothing has changed.

Color TV Mode. The second use of the *mode* command is as a means of setting up the video display screen. This particular use of *mode* only works with computers equipped with the IBM color/graphics monitor adapter; it has no effect on units equipped with the monochrome adapter. The function of the command is twofold: to align the edge of the screen so that it can be seen and to switch between forty and eighty characters per line on the screen.

Many video monitors and television sets have a particularly hard time in grasping the video signal emitted by a computer such as the pc. One of the results is a poor horizontal hold, with the result that one of the two sides of the screen is somewhat obscured. Cathode ray tubes (television tubes) are curved at the edges, and this curvature can result in one or more characters being out of sight at obviously these letters stand for *right* and *left*. This parameter is a signal to DOS to shift the entire display a fixed increment in one direction or the other. For example, if you wished to reset the screen to eighty-column mode and shift it to the right, you'd enter the following:

MODE 80,R

This would cause the screen to go blank and the entire field of view to be moved over the equivalent of two character positions. If we had left the screen in forty-column mode, it would have moved over by the equivalent of one forty-column character.

If the display is still not far enough over to the right, we can simply move it over one more increment by entering

MODE ,R

If it is too far over we could move it back by entering

MODE ,L

The final parameter is a request for a test pattern that can be used for alignment purposes. The test pattern is simply a line of numbers across the top of the display. You would request the test pattern by issuing a command something like

MODE 80,R,T

DOS would print the line of characters—in this case in eighty-column mode—and then prompt

Do you see the leftmost 0? (Y/N)

If the leftmost 0 is clearly visible, press the Y key. If not, press the N and DOS will adjust the screen and continue displaying the prompt until you have it set just right.

Of course, if you type the command

MODE 80,L,T

DOS will do exactly the same thing, but it will move the display to the left rather than the right.

If you're having alignment problems with your monitor or television set, it's worthwhile to run through this exercise once to find out how many times you need to move the screen to get its most acceptable position; then you can use that information to build an Autoexec.bat so that the display can be reset automatically every time you turn on the system.

For example, if you found that you needed to move the screen two increments to the right in order to see the whole picture, you could build an Autoexec.bat file that would set it up correctly every-

time. The file would be something like this:

```
REM This is an Autoexec.bat file to set up the monitor
REM Turn on 80-column mode and move to the right
MODE 80,R
REM Move once more to the right
MODE ,R
^ Z
```

Such a file would certainly make life a lot easier and eliminate a troublesome and potentially fatiguing situation.

Crosstown Mode. The third use for the *mode* command is in conjunction with the IBM Asynchronous Communications Adapter or its equivalent. As was explained earlier, this type of interface card can be used to drive many different kinds of peripheral equipment, including a serial printer. Since so many different types of equipment can be driven with the serial interface, this particular version of the *mode* command is actually quite complex; it encompasses many obscure variables that may not mean much to the beginning user.

The exact syntax model for this version of the *mode* command is

MODE COMn:baud[,parity[,databits[,stopbits[,P]]]]

where *n* is the number of the serial interface (either 1 or 2); *baud* is a number that defines the speed at which characters will be transmitted and received; *parity* is either E for *even*, O for *odd*, or N for *none*: *databits* is either seven or eight and defines how characters are being transmitted; *stopbits* is either one or two and defines how characters are terminated when being transmitted; and *P* is used as an indicator of whether a serial printer is attached or not.

Each of these terms relates directly to general data communications and will be encountered many times when you're dealing with any type of interface—whether it be to a printer or over a telephone line to a remote host computer. To understand each of these terms a superficial knowledge of the methods of data communication is required.

The issues are best visualized in the context of communications over a telephone line. A telephone line is a good example of a serial interface. There is only one line between any two communications points, so that data must be sent in a serial fashion.

The method that has been standardized and accepted by the Bell system is the one whereby bits of information (either zeros or ones) are converted to specific audio frequencies. These audio frequencies are within the same frequency spectrum and bandwidth as normal voice data. Therefore, anywhere a voice line can go, computer data can follow.

The two problems most frequently encountered in communicating this way involve the differentiation between normal line noise and information and the synchronization of signals between the transmitting and receiving devices.

Imagine that you're typing information into your pc and having it transmitted across a telephone line to another computer. Obviously you don't type every character in an organized and easily timed fashion. How then does the remote computer know when you are sending information?

The answer lies in the format in which the information is sent down the line. As you may know, alphanumeric characters can be represented by means of bit patterns, known as ASCII codes (for American Standard Code for Information Interchange). ASCII is used universally with one glaring exception—IBM's larger computers.

The problem of synchronization is best illustrated by way of an example. Suppose we wanted to send the simple string "ABC" across a communications line. The ASCII codes for these characters are

```
A  1000001
B  1000010
C  1000011
```

As you can see, each of these characters is represented by a unique pattern of seven bits (binary digits). To communicate these characters, we could simply send out the binary string

10000011000010100011

which does accurately represent the three characters. However, this doesn't make much sense at the receiving end, since the receiving computer doesn't know, and can't tell, where the representation of each character starts and stops. To pass this information across, the concepts of *start bits* and *stop bits* were introduced.

Start bits and stop bits are used to frame each character. Most systems use an arrangement whereby one start bit precedes the character and one or two stop bits follow it. Assuming two stop bits, our transmission would take on this appearance:

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(start) 1000001 (stop) (stop)
(start) 1000010 (stop) (stop)
(start) 1000011 (stop) (stop)

which, of course, is much simpler to understand and decode. In such a situation, we would have one start bit, seven data bits, and two stop bits. Essentially, ten bits would be transmitted for each character of information.

The other problem we run into is differentiating between signals and noise. In many cases it is extremely difficult to make out voice information over the telephone lines. Computers face a similar problem in identifying ones, zeros, and no information at all. Consequently many errors can occur, even in the simplest transmission. To guard against these errors, a scheme called *parity* was introduced.

The Extra Bit. The parity scheme works very simply—and often quite elegantly. The transmitting device counts the number of ones being sent for each character. An additional bit is then tacked on to each character. The additional bit is either a one or a zero, depending on whether the total count of ones is odd or even. This eliminates the worst type of transmission error, in which a single bit in a character is not received correctly. Such a simple error, since it isn't catastrophic, is very difficult to detect. However, when such an error occurs, the entire sense of the information being transmitted, particularly if the information is numeric, can be modified.

Three types of parity are used. *Even* parity adds another bit to each character in such a manner that the total number of ones is always even. *Odd* parity does the opposite; it ensures that each character contains an odd number of ones. If the receiving device detects a character that does not conform to this rule (whichever rule is in effect), it can signal the controlling software; the latter then requests that the transmitting device retransmit the offending character until it gets it right. *No* parity means that the upper bit—which is always transmitted first—is always set to either a one or a zero and is therefore meaningless and to be ignored at the receiving end.

The last of the strange terms used in this context of *mode* command is baud. *Baud* is simply a numeric indication of the speed at which characters are transmitted. For example, the term *300 baud* means that three hundred total bits are transmitted every second. This usually can be translated roughly into a number of *characters* per second by following a simple rule of thumb. The most popular method of sending information between two devices is to use one start bit, one stop bit, one parity bit, and seven data bits—for a total of ten bits per character. Therefore, a transmission rate of 300 baud usually translates to thirty characters per second.

Dual Bauds. When you are entering the baud rate parameter in this version of the *mode* command it is necessary only to enter the first two characters. For example, if you are setting up for 300 baud, simply enter *30*. For 9,600 baud, enter *96*. The baud rates that *mode* will accept are 110, 150, 300, 600, 1,200, 2,400, 4,800, or 9,600.

In this context the *mode* command is used to configure a general-purpose serial (asynchronous) interface to a specific piece of peripheral hardware. In general, the add-on equipment will be well documented and will have a table explaining how these parameters are to be set. The last parameter, however, the *P*, is used to indicate that the peripheral equipment attached to the named serial port is actually a serial printer.

When this parameter has been specified, the pc will output information in a special mode. This mode takes care of what are called *timeout* errors. Timeout errors arise when a device does not answer a call within a specified time. The purpose of this type of error is to prevent the computer from hanging if a peripheral dies in the middle of an operation. That is, if a piece of attached equipment fails to perform, then the computer will wait for only a prespecified amount of time before it gives up and goes back into operation.

Aborting Aborts. In the case of a printer, there are times when you won't want the computer to return to normal operation when the printer has been shut down. For example, if you are using a letter-quality printer and are manually changing sheets of paper between pages, you will not be too happy if the computer aborts the printing operation each time you try to make a change. Specifying a *P* as the final parameter in this version of the *mode* command remedies this situation.

However, if you ever find yourself in a situation where you do not want the computer to wait for you—for example, when the printer really does break down—simply press the control-break key combination, and normal operation will resume.

The fourth and final application of the *mode* command brings us to a point where we need to discuss a feature of DOS that sets it apart from other operating systems of its genre. This feature is called *device independent input/output*. Without getting too technical, the purpose of this feature is primarily to allow the redirection of input and output streams.

To date, we have seen one interesting example of this feature in the method by which we've created batch files on the fly—by using the

COPY CON: MYFILE.BAT

command. What this command accomplished was the redirection of character stream required for the *copy* command from a disk file to the keyboard—with the result that *copy* actually treated the characters typed at the keyboard as though they were a disk file.

In a similar fashion, the character stream output that is normally directed to a parallel line printer, such as the IBM 80 CPS Dot-Matrix Printer, can be redirected to a serial letter-quality printer attached to an asynchronous communications interface card. You'd accomplish this by means of the command

MODE LPT#:=COMn

where # is the number of the line printer (either 1, 2, or 3) and *n* is the serial port number (either 1 or 2 for the IBM asynch card). This command initializes the letter-quality printer as the primary output device. To redirect the output back to the parallel printer, you'd issue the command

MODE LPT1:80,6

—the same command we saw earlier.

That pretty much covers the function of the *mode* command. Since it is such an obscure command, much detail was eliminated from this discussion. This was done deliberately for two reasons. First, many of the idiosyncrasies of DOS should now be familiar to you, and as we have seen before, rules that apply to one DOS command can usually be applied generally. Second, *mode* is not the type of command that should be part of the everyday operation of your pc.

In fact, the *mode* command should really only be used when you want to reconfigure your system. This should be necessary only whenever the system's physical configuration changes—whenever you install a new printer, or if you add a modem to your system, for example. By experimenting and reading the manufacturer's documentation you should be able to determine which version of the *mode* command, if any, is required to reconfigure your system.

You Batcha! If you determine that you do indeed need to use *mode*, you should build it into a batch file so you can invoke it with very little fuss. This eliminates the need for long, involved keystroke sequences every time you turn your system on. If it is a permanent alteration that you will need to have in effect all the time, then you should take advantage of DOS's Autoexec.bat capabilities.

Thankfully, that about does it for this month. As you can see, the *mode* command is a bit more complex than its simple name implies. Since this is the Christmas season, though, many people will be adding new peripheral equipment to their systems. Let's hope this month's article will help in putting it all together and making it work.

Happy holidays! ▲

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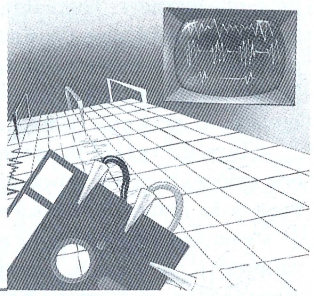

Unless otherwise indicated, software reviewed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

FriendlyWare PC Introductory Set. By Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore. This package is one of the best software values available for the pc. The twenty-nine programs consist of four demonstration and information programs, seventeen games, and eight utilities. The package is sold for less than other software houses are charging for three or four games of lesser quality. FriendlySoft maintains a twenty-four–hour telephone help line, which makes the nature of this bargain even more apparent. The programs are so well written from a user's point of view, however, that it should rarely be necessary to use the help line.

The demonstration and information programs are a painless introduction to computers in general. They are ideally paced to help naive computer users begin learning about their new computers. The *Information* program is a brief history of electronic computers, focusing mainly on gee-whiz comparisons of computer size and power. Along the way, terms such as *bit, byte, storage, input,* and *output* are introduced and explained. Specific reference to the pc is made wherever possible. Other selections on the menu include the dissection of one of the programs in the package and a glossary of some of the more frequently used commands. Three additional demonstration/information programs are a vision and hearing test, a demonstration program for text-mode graphics, and a program that describes the development of an automated accounting system.

The seventeen games are not likely to appeal to the jaded tastes of arcade addicts. On the other hand, they are outstanding examples of what can be done with text-mode graphics. The collection consists of *Mastermind* (a number guessing game), *Nevada Dice* (craps), *Killer Maze* (a difficult visual simulation of a maze), *Sea Battle* (get the enemy submarine before it gets you), *Boggy Marsh* (find the monsters by following N-E-S-W directions), *Hangman, Tick Tack Toe, Wildcatter* (an elaborate oil drilling game), *Othello, Peg Leg* (a Chinese checkers-type game), *Blackjack, Dominoes, PC Golf* (a golf game simulation), *Head Coach* (an electronic football game), *Match* (a version of television's "Concentration" show), *Towers of Atlantis* (the *Towers of Hanoi* game), *Personal Biorhythm* (biorhythm charting based on date of birth and desired starting date), and *Sports Predicting* (a combination of biorhythm speculations and football predictions).

Many of these games have been around for years and have been published in books of Basic computer games. However, the implementation and sophistication of the *PC Introductory Set* games are superior to anything you are likely to find in the public domain. Additionally, many of the games have been tailored to the capacities of pc text-mode graphics. *Hangman*, for example, has a delightful little figure who dies sadly if you fail to guess the word and dances a little jig if you save him. *Nevada Dice* allows you to sell your stereo, your car, your house, and (*horribilis dictu*) your computer if you go broke and need money. It also makes suitable comments if you attempt to cheat.

Several of the games are original or contain modifications of the original games. *PC Golf*, for example, is an ingenious simulation that allows user selection of three different courses, fifteen golf clubs, strength of swing, handicap, and defects in one's game. It is peppered with comments from the computer on your golfing abilities and intelligence. *Sports Predicting* is another original that generates football predictions based on the biorhythms of the full rosters of both teams and the date the game is played.

It would be a mistake to pass this package off as merely a collection of games and demonstrations. The biggest surprise in the *PC Introductory Set* is the sophistication and power of the *Check Register* utility program. This program allows you to keep track of up to ten separate accounts. All the normal checking transactions (checks, deposits, and bank charges) may be entered through a well-designed interactive visual format. The accounts may be reconciled as cancelled checks come in. A summary statement and a listing that mimics your handwritten check register may be obtained at any time.

However, the real power of this program becomes apparent when you call for the various listings that are possible. Check listings and summaries may be extracted for outstanding checks, cancelled checks, bank charges, voided checks, and deposits. More important, listings and summaries may be extracted for individual recipients and for any or all of up to twelve user-defined expense

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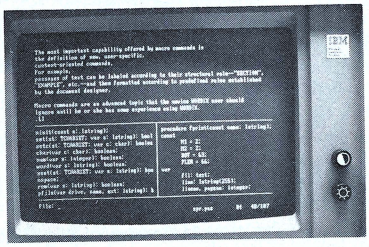

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codes. This is actually a miniature database management system for personal finances. The value of such a system becomes increasingly obvious as income tax time draws closer. The early copies of the program had a severe limitation on the number of transactions. However, this problem has been corrected, and FriendlyWare will replace an old copy in exchange for the original disk.

Given the cost of the program, there is no cause for complaint. If one ignores the cost, however, there are a few things that could have been done better. It seems as though the manual writer just ran out of steam by the time he or she got to the business utilities. These utilities (*Depreciation, Inventory Reorder, Present/Future Value, Amortization, Economic Order Quantity, Break Even Analysis*, and *Stock Ratios*) are present on the disks, but there is no documentation whatsoever in the manual for them. While the programs are written well enough that a person who knows their purpose could run them, it would have been nice to provide some explanation for the uninitiated.

Overall, the *PC Introductory Set* is an outstanding, high-quality program set. It is a smorgasbord on which everyone is likely to find at least a few tasty morsels. **bo**

FriendlyWare PC Introductory Set, by Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore, FriendlySoft (213 Pebblebrook, Arlington, TX 76014; 817-277-9378). $49.95.

Life and **Microcosm.** Despite the different names, both of these programs are versions of a computer game developed over a decade ago, usually referred to as life. (For more on the subject, see the article that begins on page 30 of this issue.) Life has been implemented by countless programmers on a great variety of machines over the past dozen years. It is not surprising to see it make its appearance on the Personal Computer.

Briefly, life is a solo game that traces the growth and death of patterns on a grid over a series of generations. Though it has been played on even the most primitive microcomputers, the Personal Computer is something of a comedown from the days when it occupied sophisticated mainframes at MIT. You may never reproduce the MIT experiments with your little beige box, but you can easily create over 90 percent of the life patterns that have been published over the years.

Life requires 32K and a color adapter. As you might expect from the name, it is a rather plain, straightforward implementation of the traditional game. However, it is colorful and fast-moving.

Life uses a forty-column screen, with edge wrap optional. (The edge wrap will allow, for example, a moving pattern to exit the screen and appear on the opposite side.) Each dot is a happy face from the standard character set. As the generations change, the colors change too. The oldest dots stay white, but each succeeding generation has a different color, one of fourteen. After a few generations, the screen can become a rainbow of greens, reds, yellows, and so on; blossoming, dying out, and being reborn.

Life will run in a fast mode of about ten generations per second or a "slow" mode of about half that speed. It is also possible to use the number keys to walk through the generations, one to nine at a time. A pattern can be saved to disk at any point. There is also a help key and a spectacular demo mode, certain to gather a crowd.

Life is a powerful but bare-boned program. The creators of *Microcosm* took a very different approach. Once again, happy faces multiply on the monitor. However, instead of a couple of stapled pages of documentation, there is a thirty-two page booklet. Instead of one demo routine, there are fifty patterns on the disk (and you can add your own). Instead of a help key, there is an interactive tutorial. There's more—counters that show the generation number and the population, some cheerful sound effects (that can be turned off), and a "future-see" mode so you can anticipate the results of any changes.

As if that weren't plenty, there is provision for playing the game in competition mode, with two boards on the screen. Or you can play "microbe virus," with each player controlling distinct cells on the same board. Moreover, you can change the rules of play, so that two cells generate a third, for example, or so that a cell with five or more neighbors dies off.

To implement all these options, there is an intricate series of prompts and menus with error trapping at each step. Unfortunately, the program continually goes to disk to fetch this routine and that, and it takes more than a dozen keystrokes to go from booting up to playing the game. The color is a cheerful green and red, but the 17x17 grid is too small for some patterns, and it is updated at only five generations a minute. The fifty patterns provide an outstanding, though somewhat flawed, library; not all of them are keyed in properly.

Of the two versions, experienced life gamers will certainly prefer *Life*. However, *Microcosm* might be a better choice for a novice. It is the only choice if you have a monochrome monitor, if you want to play in competition, or if you want to tinker with the laws of life. **fj**

Life, Olive Branch Software (1715 Olive Street, Santa Barbara, CA 93101; 805-962-4682). $17.

Microcosm, Aeon Concepts (1657 Red Mill, Pittsburgh, PA 15241; 412-831-5352). $39.95.

Pig Pen. After a popular and well publicized orgy of scarfing electronic spots, what only naturally could follow? You guessed it—dropping the dots.

The new arcade game from DataMost with the hog-wallowing monicker of *Pig Pen* will be available when the home-arcade army gets ready to bring home the bacon. A maze game with a slippery shade of a difference, *Pig Pen* could also be called Vengeance of the Hams. While you scoot through the labyrinth trailing dotted lines, a posse of persistent piglets is out to knock your socks off at every turn. (Swine!) If you are able to crisscross the maze with pellets without getting crossed off first, you will be lifted to the next of

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four game levels.

The better you get at the game, the madder the hi-res porkers get (after all, pigs are people too); the hazardous four-footed action speeds up with each advance, and on the fourth level the pigs actually get smarter.

The only chance you have of putting the pigs in their place is when you trip upon a super spot known as an energizer. The game starts squealing to hog heaven, the piglets turn into ghostly poker-faced portraits, and you race through the maze like a crazed butcher, turning the tables on your attackers by pouncing the heads into ham shanks at 200 points each. Not a bad score for clobbering your own holiday ham dinner, knowing it had just been licking its chops at you.

And what could be nicer with a ham feast than an ear of sweet, golden corn? One or two stalks will pop up each game; be sure to grab one while it's hot for some extra points.

With ghostly-headed hogs and rampaging killer pigs after you as you're trying to seed your maze, *Pig Pen* offers proof that farming isn't as bucolic as it's cracked up to be. Color/graphics adapter required. **mf**

Pig Pen, by TMQ Software, DataMost (9748 Cozycroft Avenue, Chatsworth, CA 91311; 213-709-1202). $29.95.

ColorPlus. This is a new color/graphics adapter for the IBM Personal Computer. The ColorPlus can be used instead of the IBM Color/Graphics Adapter, and it includes—in addition to all the IBM adapter's features—a built-in parallel printer interface and advanced graphics modes.

All IBM Personal Computer software that uses a color/graphics adapter works with the ColorPlus without any added steps to get it running. The ColorPlus emulates the IBM Color/Graphics Adapter capabilities in exacting detail so there is virtually no telling whether you're using the IBM board or the ColorPlus, except on those occasions when the software you're using takes advantage of the ColorPlus's advanced color graphics capabilities.

The eighty-character, high-resolution mode on the IBM pc provides for two colors: black and white. The ColorPlus can perform like that, or it can offer you four colors in this mode—and none of the four needs to be black or white. In fact, the high-resolution mode on the ColorPlus is quite similar to the medium-resolution mode on the IBM Color/Graphics Adapter: You may select one of two palettes of three colors (green, red, and brown or cyan, magenta, and white) over a background of one of sixteen colors.

In the forty-character, medium-resolution mode, the ColorPlus offers sixteen colors over a background of one of sixteen colors, whereas the IBM Color/Graphics Adapter offers only four colors over a background of one of sixteen.

Rather than enhancing Basic on the IBM Personal Computer to allow the user to take advantage easily of the extended graphics capabilities of the ColorPlus, all the demonstration programs supplied with the ColorPlus use a smattering of *out* statements that send binary-coded values to the ColorPlus adapter, to "brute force" it to do its tricks. The coding is not for the feebleminded, since the method by which the ColorPlus generates additional colors is to superimpose one video page over another. To get a high-resolution circle in yellow, in other words, you must draw one circle in red and another in green on another "page"—and then mix them. This takes more than a simple *color* and *circle* statement; it requires a couple of *out* instructions (carefully coded) as well.

A programmer of reasonable experience will be able to make sense of and use the advanced features of the ColorPlus adapter; those of us who need help reading the IBM Basic book will not do well at understanding the ColorPlus documentation. For those considering the ColorPlus, suffice it to say that the ColorPlus has *potential* that can be realized—definitely more potential than the IBM

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Color/Graphics Adapter; the amount of general acceptance the ColorPlus receives will prove to make it or break it. rk

ColorPlus, Plantronics/Frederick Electronics (Box 502, Frederick, MD 21701; 301-662-5901). $995.

Floppy Frenzy. This game is a graphic lesson on how to protect your disks. A *very* graphic lesson. Your disk inhabits a maze of prowling magnets, all eager to depolarize its helpless mylar. To defend itself, it runs around creating traps. When a magnet hits a trap, it momentarily becomes a weak little bar magnet and can be safely glomped.

You use arrow keys to navigate the maze. The magnets move at random. You have to clear the screen of them before a certain time; if it looks like you aren't going to make it, you can hit the F10 key to set up a new maze with half your present point total. If you do clear the screen, you are presented with a new one and a lot more magnets. You have three floppies. When the last one is gone, you watch your disk being carried off to floppy heaven by a sympathetic angel.

Of course, magnets are only one menace. At higher levels, you are also confronted by dustmen. They behave a lot like magnets, but killing them off brings an additional benefit—you gain an extra floppy. No matter how many magnets and dustmen you destroy, their ever-increasing numbers are bound to overwhelm you in the end.

This is certainly a very professional-looking game. The graphics are sharp; the animation is smooth. The (raucous) sound can be turned off. The only possible criticism is that it could have been better. It would be nice if you could escape from the angel sequence, if you could save a high score to disk, if you had a better idea where traps are allowed, if the magnets did not have a chance to pounce on your disk before it gets to move. However, the worst problem with this game is that you'll probably find it addictive!

Nevertheless, *Floppy Frenzy* is a fine example of the arcade genre, and one with special meaning for the oppressed computer user. Color/graphics adapter required. fj

Floppy Frenzy, Windmill Software (1058 Joan Drive, Burlington, Ontario, Canada L7T 3H2; 416-632-6279). $39.95.

A Christmas Sampler. By Mark Cross and Rick Coleman. Ho, ho, ho! Here's a stocking-stuffer for you! 'Tis the season to be jolly, and the merry gentlemen at Spinnaker have put together a program that will bring love and joy unto you, and a toast to the new year too.

There are twelve Christmas songs on this disk, each with a colorful display. There's also "The Night Before Christmas." And there's the main event, the Christmas story, more or less as given in the Gospels. A color/graphics adapter is required for all this cheer.

Spinnaker has done a good job of conveying the Christmas spirit to an inanimate machine. When "visions of sugar plums dance in their heads" in the story, they dance on the screen as well. When Mary and Joseph arrive in Bethlehem, it is to the tune of "O, Little Town of Bethlehem." Most figures are painted to the screen slowly, but when an angel appears, it is suddenly, as befits the omnipotent power of the Lord. Those of inventive mind have the option of changing the tempo and pitch of the songs, slowing "Jingle Bells" to a dirge, or playing "Silent Night" in *presto furioso.*

The computer does its best, but it is not the best forum for religion or Yuletide merriment. The colors are bright and cheerful but do not entirely compensate for the uneven quality of the graphics and sound. The hoofbeats and tiny reindeer, for example, are somewhat reminiscent of *Space Invaders.* Despite this, the *Sampler* certainly does its job; it can stoke warm feeling even in hard-bitten, cynical computer journalists. And if you take the "Run everything continuously" option, you will put your loved ones in the Christmas spirit—or drive them out of the house! fj

A Christmas Sampler, by Mark Cross and Rick Coleman, Spinnaker Software (26 Brighton Street, Belmont, MA 02178; 617-868-4700). $29.95.

Starcross. By Dave Lebling and Marc Blank. If it takes a minimum of two instances to form a proposition, then *Starcross*, adventurous Infocom's first foray into science fiction and second departure from the dungeons of *Zork*, enables the proposition that this young company is one of remarkable versatility and apparently unerring ability to implement fresh and fitting approaches to multifarious subjects. *Deadline*, the you-solve-it mystery, was, of course, instance one.

Starcross resembles *Deadline* and the *Zorks* only in the benevolent intelligence that is a hallmark of Infocom's work. In every other regard, it serves its own identity—that of a sci-fi situation and story. The scope, the structure, the language, the events, the requirements on the player are all dictated by the genre and its time and setting.

Where the *Zorks* are set in the fantasy world of Dark Ages magic and myth, where *Deadline* is set in the very mundane world of the British-like parlor murder mystery, *Starcross* is set in the no less fantastic and no more obvious world of the possible future.

As the game begins, you find yourself on a one-person spacechip, searching for black holes. With you are only your smart-aleck computer and your mass detector. Amazingly, when the mass detector proffers you a pictorial map of nearby space, you the real person can reach in your *Starcross* package and pull out the exact map in four glossy colors. You'll need it to direct the computer as to the course to take to your destination (why on earth didn't you pop for the gadget that interfaces the mass detector directly to that cantankerous computer?).

But instead of a black hole, you find an asteroid-size spaceship. What you find there and what you do with it all are the meat of this outstanding adventure. As with so many excellent adventures, determining your purpose is an integral part of the plot.

Starcross is painted in brilliant colors with ultra-high-resolution detail; as usual, Infocom has created these splendid graphics entirely with words. This is a text, or, as the authors prefer, and appropriately so, a prose adventure.

No puzzle in *Starcross* is illogical, although many require good imagination and truly innovative thinking. Picture facing an apparent dead end. Nothing you'd expect to work solves this puzzle. You mull the problems and all the pieces a long time, and finally an idea comes. It's complex, it's far out, it's got to be out of the question—no one else would have thought of that—but it's thoroughly logical. Just for kicks, you try it, expecting another dead end. Instead, the program understands, responds—you weren't crazy; those guys actually think like you. But wait—they've taken it even farther; you'll have to stretch your mind even more. Like most good stretches, it feels delicious.

Infocom's adventure vocabulary continues to expand. The famous *Zork* parser allows you to speak to the IBM as though it were a person. When it doesn't understand, it makes perfectly clear what it doesn't understand. No guess-the-right-synonym games here.

No adventurer should pass up *Starcross.* And, if you are new to this kind of game, *Starcross* is a good place to start. mct

Starcross, by Dave Lebling and Marc Blank, Infocom (55 Wheeler Street, Cambridge, MA 92138; 617-492-1031). $39.95.

Adventure in Serenia. By Ken and Roberta Williams. Help! Princess Priscilla has been kidnapped! The evil wizard Harlin is holding her in his castle in the north. You must cross deserts, oceans, and mountains to get there and bring her back. Dangerous ravines and hungry crocodiles will block your path. Mischievous gnomes and angry giants will impede you. Of many who attempt this quest, only a few can succeed, but those who do will be rewarded with the splendiferous title of Junior Master Adventurer.

Liberating princesses is getting to be an obsession for game programmers. (Being a princess must be a high-risk occupation!) This particular royal rescue is a graphics adventure, a new implementation of *Wizard and the Princess*, originally marketed by Sierra On-Line for the Apple II.

A graphics adventure is like a text adventure with pictures. In-

stead of just reading "You see rainbow," you're presented with one on the screen, in beautiful color. When you "get" an object, it disappears from the screen, and when you "drop" it, there it is again. The machine language routines in this program shift the scenery very quickly, and there is sound as well, so when a rattlesnake threatens, you can both see and hear it.

If you have never played a graphics adventure, prepare for a pleasant surprise. You will get to see the aforementioned princess, castle, and desert in glowing color. The nature of a graphics adventure involves a few minor quirks—objects sometimes seem to be floating in air, and you must often hit the scroll key to see all the text. But you'll quickly get used to this.

To the attractive graphics, there is added the mechanics of a classic-style adventure game. This is not *Zork*, and you cannot say "Pick lock with knife," for example. What you can do is say "Pick lock," and add "with knife" when the program prompts you.

The most interesting thing about this game is the endless opportunity for dying. You have wonderful opportunities for being drowned or poisoned. You can also explore the exciting possibilities of being eaten or falling to your death. You are a very clever fellow if you die only once or twice in the course of this adventure. Fortunately, the game can be saved, so you do not have to restart your lives from the beginning. This feature also eliminates the tedium of searching the desert for rocks in the first part of the adventure (one of its few dull moments).

This was the first full-color adventure ever implemented for a microcomputer. It is appropriate that it should be the first for the Personal Computer. Though there are shortcomings, in choosing this game to market, IBM is going with a classic.

Requires 48K and color/graphics adapter. fj

Adventure in Serenia, by Ken and Roberta Williams, IBM (Box 1328, Roca Raton, FL 33432; 305-998-2000). $35.

Space Strike. By Michael Abrash. Earth is doomed. Waves of alien invaders are descending, firing as they come. To hold off these hordes, you have three mobile gun platforms that can be deployed only in series. There are also a few buildings you can hide behind, but alien gunfire will eventually reduce these to rubble. If you destroy one skyful of aliens, a second, meaner set will replace it. Whole air wings of aliens seem to be stacked up in holding patterns as far as Alpha Centauri, all with a craving for your destruction.

As you may have guessed, this is a Personal Computer-adaptation of the classic arcade game *Space Invaders*. The multicolored aliens shift across your screen much like those in the original game. As they diminish in number they increase in speed, becoming extremely difficult to hit. The tension-building music is gone, but there are some exciting sound effects (that can be turned off).

Space Strike includes a number of enhancements. Three different kinds of saucers cross the top of the screen, dropping deadly torpedoes. When you shoot one, it does not just disappear, it falls to pieces in a cloud of wreckage. Even more spectacular is what happens when your gun is hit—it explodes, filling the screen with a fireworks display. There are seven levels of difficulty; if you don't want to start with the "easy" game, you don't have to.

Space Strike can be played with either keyboard or joystick. If you use a keyboard, you can designate your own playing keys and they will automatically be saved to disk for future games. For some reason the arrow keys cannot be chosen. There are a few other small glitches. At the start of every game the program displays point values of the various aliens and gives you the chance to type in options for play. But it automatically proceeds to the game after only a few seconds, giving you little chance to consider your alternatives. Aside from this, *Space Strike* is problem-free.

The Personal Computer has great potential as a game machine, and *Space Strike* deserves a place in every gamer's library. fj

Space Strike, by Michael Abrash, DataMost (9748 Cozycroft Avenue, Chatsworth, CA 91311; 213-709-1202). $29.95.

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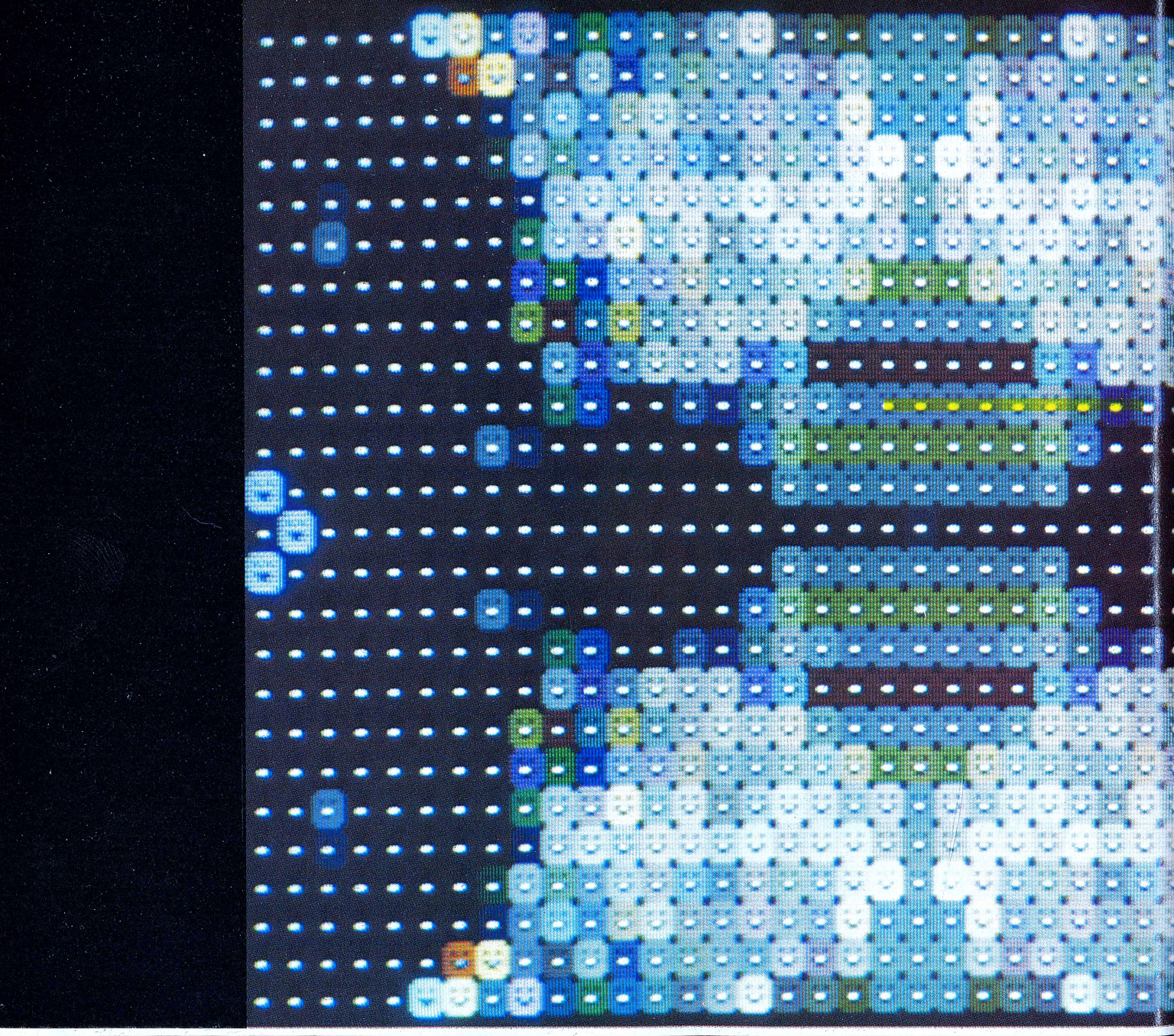


The Game of

by Forrest Johnson

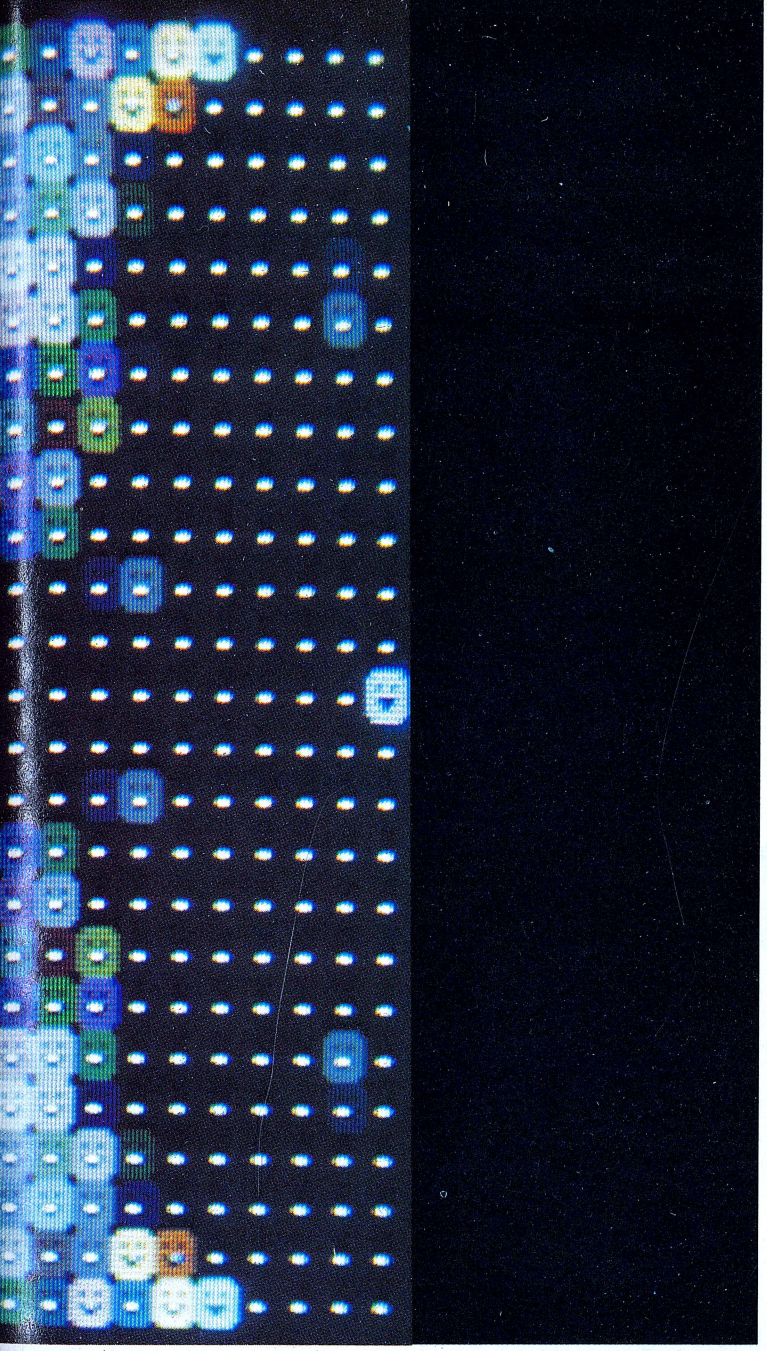
Imagine a game that has only three rules and one player. It can end the second turn, or it can go on forever. It can be played on a checkerboard, but a computer the size of the universe might not be big enough for some games. There are no winners to this game, no tournaments, and no cheerleaders.

Who would want to play a game like that? Some of the most respected mathematicians who hold chairs in our universities, and thousands of enthusiastic hobbyists everywhere.

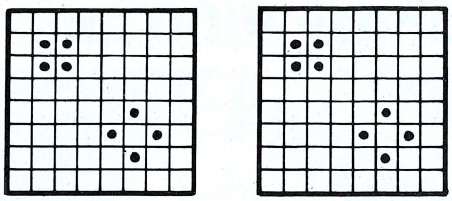
The Laws of Life. The game is called Life. It was invented in 1970 by Cambridge mathematician John Horton Conway. It is played on a checkerboard grid that extends indefinitely in all directions. Each cell on the grid can be considered empty or full ("dead" or "alive"), depending on what occupies the eight surrounding cells, and on the following laws:

1. *The Law of Survival.* A cell with two or three neighbors will survive for the next generation.
2. *The Law of Death.* A cell with more than three neighbors will die of overcrowding. A cell with fewer than two neighbors will die of isolation.
3. *The Law of Birth.* An empty cell with exactly three neighbors will be filled in the next generation.

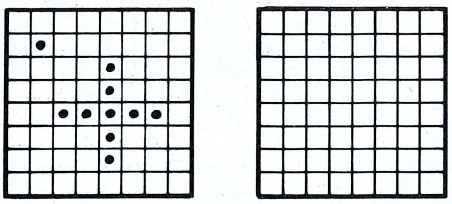
The three laws operate simultaneously, and every generation of Life may produce a new pattern. Depending on its shape, a pattern may be static or changing. It may move about the board. Some pat-



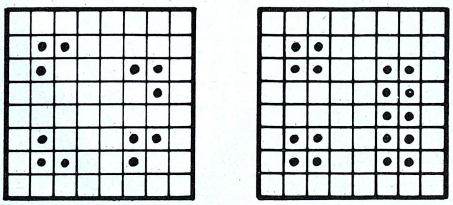
The Laws of Life



The Law of Survival. A cell with two or three neighbors will survive for the next generation.



The Law of Death. A cell with more than three neighbors will die of overcrowding. A cell with fewer than two neighbors will die of isolation.



The Law of Birth. An empty cell with exactly three neighbors will be alive in the next generation.

it tends to destroy patterns that come too close to its "head." It is by no means certain that an eater will devour anything it encounters. It can be entertaining to experiment and see how much an eater can digest. Two eaters set almost head to head will form an oscillating pattern; each will try to destroy the other, but neither can succeed. That brings up something else.

Oscillators. An oscillator shifts from shape to shape in a repeating pattern. Most oscillators have only two phases. In this class is the *blinker*, which consists simply of three cells in a row. Other two-phase oscillators include the *beacon*, which goes on and off; the *toad*, which puffs itself up; and the *clock*, which seems to turn. Some oscillators are expandable. You can, for example add elements to the barber pole and it will oscillate along its entire length.

Oscillators are not limited to two or even four phases. The best

Below: a glider gun shoots at an eater.

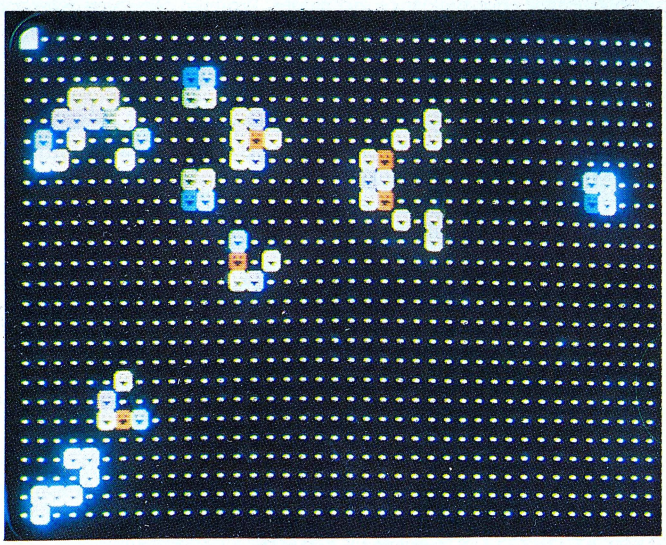
Life

terns can give birth to new ones. Others can devour intruding cells. Some surprisingly simple patterns metamorphose through thousands of generations in a bewildering series of shapes.

Various ingenious persons have devised classifications of Life patterns.

Still Lifes. A pattern that does not change is called a still life. The simplest, a square of mutually adjacent cells, is called a *block*. A diamond shape, with each cell having two neighbors, is called a *tub*. From there, the shapes get ever more complex, forming patterns called boats, ships, ponds, beehives, loafs, snakes, and so on. The number of possible still lifes possible is literally infinite.

The *eater* is a special form of still life. A twisty, seven-cell shape,



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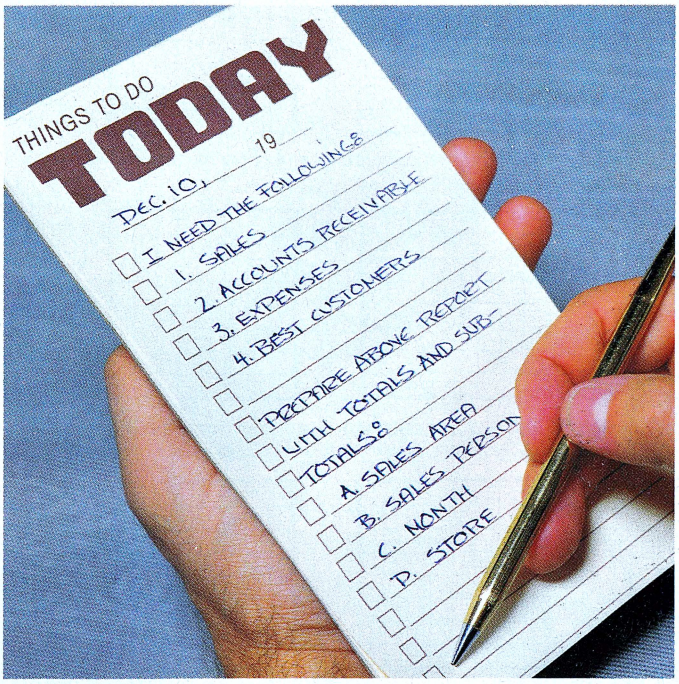

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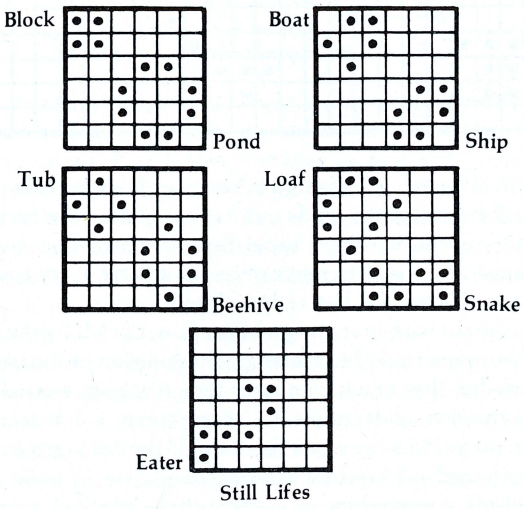
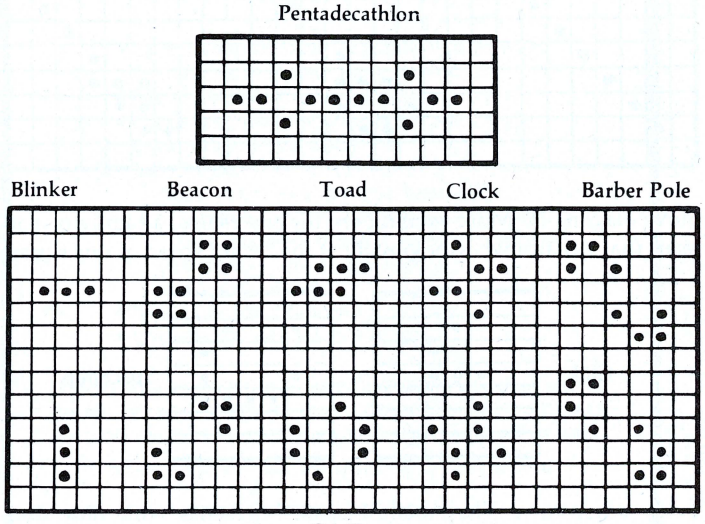
known multiphase oscillator is the *pentadecathlon*, which, as the name implies, repeats itself after fifteen generations. (Space does not permit us to show all its mutations.) *Life* enthusiasts enjoy setting up complex systems of patterns. The pentadecathlon is popular because it can, when phased properly, absorb or reflect moving patterns called gliders.

Moving Patterns. Some oscillators just won't stay put. After a few phases, you see the same pattern—surprise!—in a different location. The simplest is the glider, a four-phase pattern comprising five cells. It creeps diagonally around the board like a crab. In four generations a glider moves one square. Because the glider is such a simple pattern, it appears again and again in *Life* literature. If you see a picture of a *Life* pattern, no matter how sprawling or uncouth, you can bet that someone, somewhere, has tried to create one by a collision of gliders.

Gliders do have some limitations. They are slow and can only



Still Lifes



Oscillators

The Origins of Life

Fundamentalists may disagree, but the fact is that *Life* was created in 1970 by John Horton Conway, a mathematician at Gonville and Caius College at Cambridge. The "game" was not the first of its type. It belongs to a branch of mathematics called *cellular automata theory*, and many similar games have been created over the last thirty years, most limited to the dusty pages of scholarly journals.

Conway experimented for years before settling on the rules. He wanted to create a game in which the patterns tended to avoid the extremes of growing without limit and fading quickly into nonexistence. He had three other goals:

1. There should be no initial pattern for which there is a simple proof that the population could grow without limit.

2. There should be initial patterns that *apparently* grew without limit.

3. There should be initial patterns that grew and changed for a considerable period before coming to an end in three possible ways: fading away completely, settling into a stable configuration, or entering an oscillating series of patterns.

The first *Life* games were played with counters, but Conway found it convenient to use a PDP-7 computer for the more long-lived patterns. Conway devised many of the classic patterns—still lifes like the block and tub, oscillators like the beacon and clock, the five-cell glider, and the famous r-pentomino.

Conway didn't publish his *Life* game, perhaps feeling it too trivial for a distinguished academic like himself. Instead, he wrote to his friend Martin Gardner, who described it in his column in *Scientific American*.

Conway had hypothesized that no pattern could grow without limit. Through Gardner's column, he offered a $50 prize to anyone who could prove or disprove his conjecture. The prize was taken almost immediately by a group of six researchers in MIT's Artificial Intelligence Project. Their proof took the form of a glider gun (see accompanying article) that generated endless cells.

Gardner's initial column had sparked a reaction not only at MIT, but also in computer science departments and data processing offices all over the country. He started to get material back from his readers, enough for several new columns about the game. Soon there was a regular newsletter called *Lifeline*, edited by Robert Wainwright.

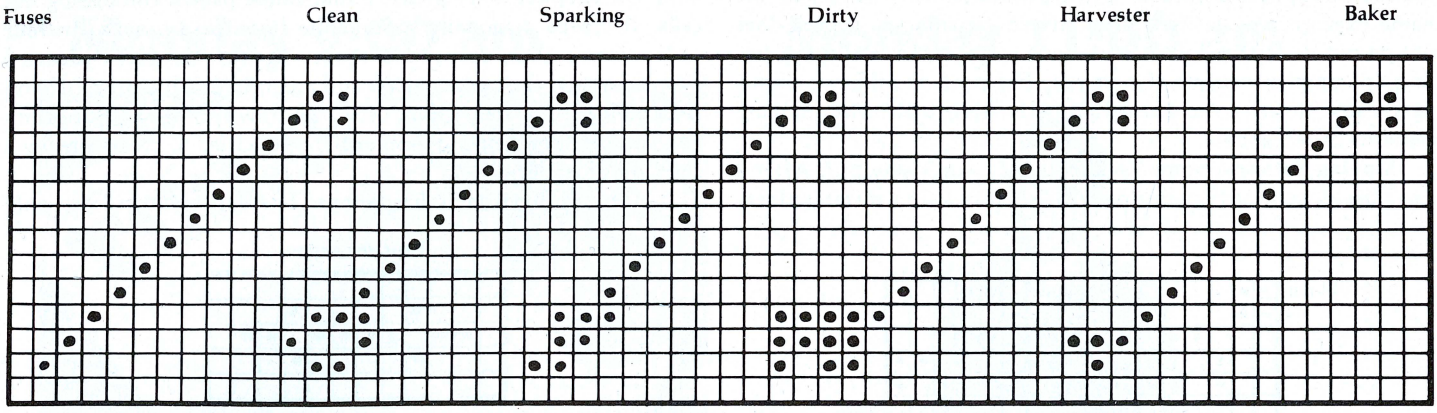
By 1974, interest in *Life* had peaked. "Computer specialists everywhere had developed such a mania for *Life* that millions of dollars in illicit computer time may have already been wasted by the game's growing number of addicts," rumbled *Time* that year.

In 1975, the game gained some academic recognition when a paper on it was published in the *Proceedings of the National Academy of Sciences*. In a sense, though, the game was already declining. The most obvious patterns had been explored, and the more complicated patterns had only a limited following. In addition, computer security was getting more sophisticated. Administrators were less willing to let their machines be used as expensive toys for programmers. The game was losing its original following. *Lifeline* ceased publication.

But something else was happening. The invention of the microcomputer was moving computer power from centralized mainframes to homes and garages. And having bought computers, hobbyists were wondering what the devil to do with them.

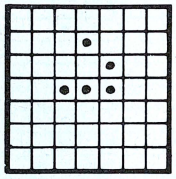
Life provided a partial answer. The game was ideal for the earliest microcomputers, since it could be programmed to run in as little as 2K of memory. As *Life* gradually disappeared from academic journals, it began to appear in computer magazines like *Byte* and *Recreational Computing*. With the spreading popularity of personal computers, each year brings a new generation to be initiated to the mysteries of *Life*. ▲

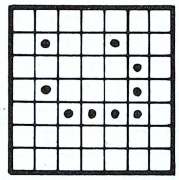
Readers desiring more information are invited to consult the programs *Life* and *Microcosm*, reviewed in this issue; *Softalk* (Apple edition), "Counting with Colors," June 1982; *Byte* magazine, December 1978; and *Scientific American*, "Mathematical Games" section, various issues from October 1970 to January 1972.



move diagonally. More exciting are the *spaceships*, a family of patterns that zip around orthogonally at the record speed of one square

Glider





Spaceship

every other turn. The smallest spaceship starts with nine dots. Larger ones are possible.

Pattern Generators. One of the first problems posed to *Life* aficionados was the design of a pattern that generates gliders. This complicated question was solved almost immediately by a group at MIT, and the glider gun remains a favorite. Even at this moment, some hobbyist is probably using a glider gun to shoot at an eater or a pentadecathlon—or another glider gun.

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In initial form, a glider gun has twenty-eight cells. The unlikely-looking collection sends out its first glider after forty generations and continues with a rapid-fire stream of one every thirty generations. Since gliders move only one square every four generations, each follows the last rather closely.

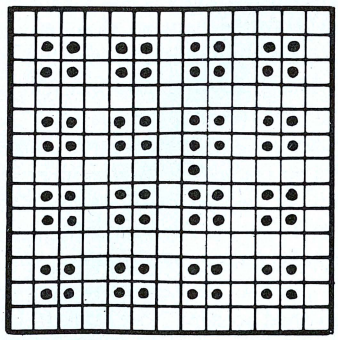
Not content with inventing a glider gun, the MIT group went on to show how one could be created by the collision of thirteen gliders. It is a safe bet that much computer time has been wasted trying to position thirteen glider guns so as to create a fourteenth. That achievement is likely to elude us, though the MIT group is said to have positioned intersecting streams of gliders to build a factory that fired off a spaceship once every three hundred turns.

Fuses. While many will prefer to see gliders and spaceships creep over the board, there is a form of motion twice as fast as any spaceship. Strangely enough, this occurs with a pattern that sits quietly and destroys itself.

A diagonal string of cells will lose one cell at each end every turn. When you anchor one end, you create what is called a *clean fuse;* "clean" because it leaves no debris (except the block you used to anchor it). A variant is the sparking fuse, which throws off small, short-lived groups of cells. It does not have the good taste to die neatly like a clean fuse. At the extreme is the *dirty fuse*, which leaves a lot of unsightly garbage in its wake.

The *harvester* is a neat, repeating pattern that gobbles up fuses and leaves behind blocks, as a thresher leaves behind sheaves of grain. The *baker* takes things a little further; it scatters loaves of bread in its wake.

Agars. While we are on the subject of destructive patterns, we might as well mention *agars*. Not that there is anything exciting about an agar; it's just a stable, cell-rich mosaic that sits still for

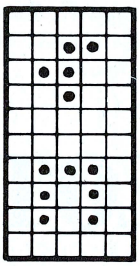


A virus prepares to destroy an agar.

generation after generation. The fun starts when you add a single cell, or *virus*, to the agar. If the virus lands in the right place, it rapidly begins destroying the healthy cells around it. It is also possible for the agar to absorb the virus before it does any damage.

Seeds. A *seed* is the opposite of a virus. Instead of destroying a big pattern, it grows to create a series of them. Probably the best known seed is the *r-pentomino*, a simple, five-cell pattern that grows

and changes for 1,103 turns. It leaves behind eight blocks, six gliders, four blinkers, four beehives, a boat, and ship, and a loaf.



The *pi-heptomino* is not so long-lived. After a mere 173 turns it has swollen and decayed into six blocks, five blinkers, and two ponds. The pattern is of interest because in the fourth generation it seems to mimic a blastula, or an embryo in its earliest form. About thirty turns later, the pattern tries to create another blastula ten squares from the first. Unfortunately, no one has found a way to save the second embryo from the trauma of birth; it is destroyed by the debris of its mother.

Life enthusiasts have discovered many other seeds, some of which grow and change for thousands of generations.

Back to the Garden. The greatest unsolved *Life* problem is called the Garden of Eden. A Garden of Eden pattern must be created artificially; it is impossible to grow one from another pattern. Theory says there *must* be a Garden of Eden pattern for *Life*, but finding one is not so easy. It has been shown that such a pattern can exist within a square ten billion units on a side, but it could be much smaller. One could, perhaps, prove that a given shape is the Garden of Eden by eliminating all possible parents, but that would be a tedious task, even for a computer.

What Does It All Mean? It should be apparent by now that *Life* is not going to beat out *VisiCalc* as a practical, easy-to-use application program. Its patterns, like chess problems, are engaging in themselves but are at most analogies for real-world conditions. Nevertheless, followers of the game resist the notion that it is merely an abstract pastime with no relation to daily life.

The name *Life* implies a tie to biology. Words like cell and virus reinforce it. The creators of the *Life* program *Microcosm* (reviewed this issue) bill it as "a simulation of birth, life, migration, and death among populations of cellular organisms." For a fact, it is possible to see the forms of diatoms in the still lifes, or the cells of living tissue in an agar. But you could spend your whole life bent over a microscope without seeing anything that resembled a blinker or a fuse. If *Life* simulates life, it is no form native to Earth.

Another analogy is between the orderly, repetitious patterns of *Life* and a computer. The game has been used to simulate a Turing machine, or universal calculator. Also, in a paper presented to the 1974 Winter Simulation Conference, Robert Wainwright sketched a method for simulating a digital computer. By using glider guns to trace the patterns of circuitry, it is possible to create extremely complicated patterns that behave like an electronic device. However, it is hard to see the utility of a computer that takes another computer to run it.

Finally, there is the fascinating theory that the universe itself, with every star and galaxy and dust cloud, is a vast board for a game of *Life* whose rules can only be imagined. As Martin Gardner put it in *Scientific American*, "There is even the possibility that space-time itself is granular, composed of discrete units, and that the universe, as Fredkin and others have suggested, is a cellular automaton run by an enormous computer. If so, what we call motion may be only simulated motion. A moving spaceship, on the ultimate microlevel, may be essentially the same as one of Conway's spaceships, appearing to move on the macrolevel whereas actually there is only an alteration of states of basic space-time cells in obedience to transition rules that have not yet been discovered." ▲

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THE PROFIT PLOT

by Shirley Fisher

A couple of months ago we discussed the need for planning for that inevitable day of retirement. The question we posed then was just how "golden" those years would be. Until recently the sources of "gold" were Social Security and a company pension plan (if you were lucky enough to have one).

In 1974 if you weren't covered under some company retirement plan, you could set up one for yourself and it would even be tax-deductible. There were some rules you had to follow, though. You could set aside as much as 15 percent of your pay into your individual retirement account. Of course, it wasn't as simple as that. Regardless of your salary, $1,500 was the most you were allowed to set aside. In other words, you could set aside 15 percent of the first $10,000 of your income.

If your total income in 1974 was only $10,000, you would no doubt have found it quite difficult to set aside anywhere near $1,500. The fact that the money you set aside was tax-deductible wouldn't have made you very excited either. You certainly weren't in a 50 percent tax bracket with a $10,000 income.

Additional rules came into play if your spouse was not working. The maximum allowable contribution in that case was raised to $1,750 or 15 percent of your pay, whichever was *less*. Then you each had to have an individual retirement account (IRA) and the money had to be divided equally between your two accounts if you wanted to be able to take the maximum tax deduction.

Were you better off if you were one of a growing number of two-paycheck families? That was not a question with a straightforward answer. If neither of you had a company pension plan, you could each set up your own account. If you earned at least $10,000, you could place the maximum of $1,500 into your IRA. But typically, if your wife was working, her paycheck wasn't as large as yours. Her income may not have been sufficient to allow a $1,500 contribution. What effect did that have?

If she earned $7,000, she could have put a maximum of $1,050 into her IRA. If she earned $9,000, the allowable amount was $1,350. Even if your income was more than high enough to put the maximum amount into your account, you still were not allowed to make up the difference in hers. Your combined income of $20,000 or more would not provide you with the maximum $3,000 tax deduction unless that $20,000 income was earned in an equal portion by each of you.

Time marches on, and the rules of the game change. With so much talk of the Social Security program being in financial trouble, Uncle Sam has decided to let everybody who is employed have an IRA, regardless of whether or not they are covered where they work. Nice idea. He's also decided to raise the maximum allowable con-

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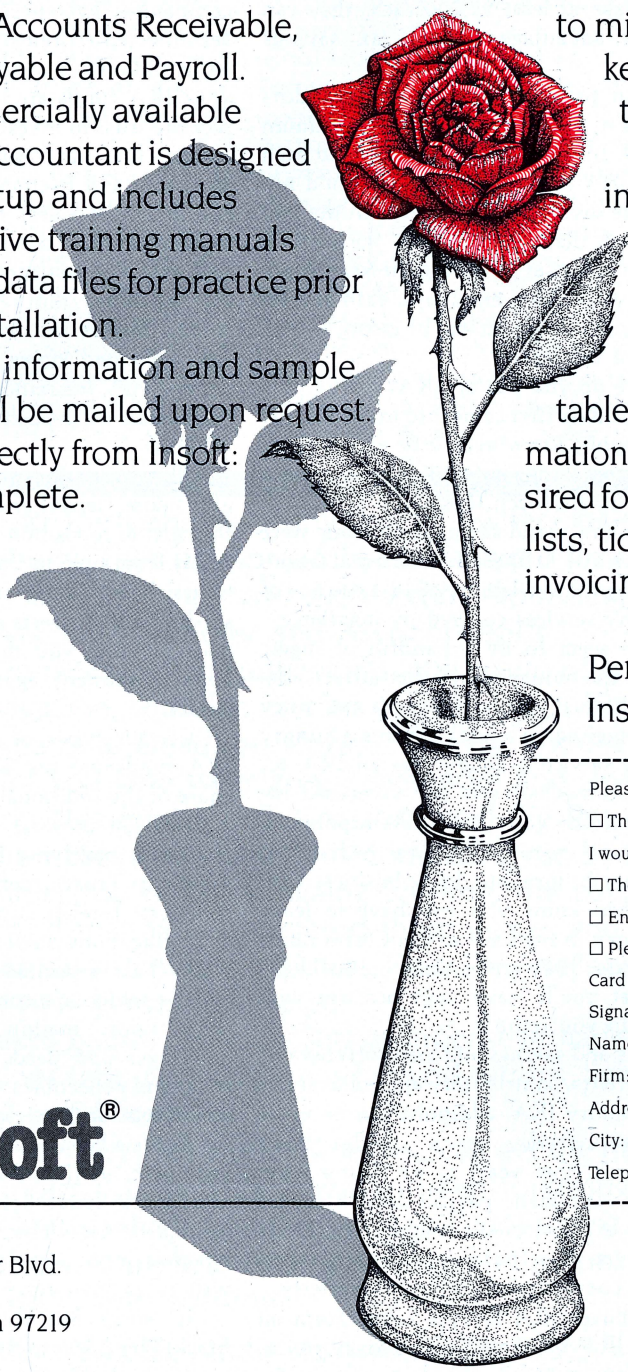

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tribution from $1,500 to $2,000. Also nice—but with inflation at its present rate, that hardly makes any difference.

There have been some significant changes in the rules of the game that went into effect in January 1982. You are no longer held to a 15 percent contribution. Even if you only earn $2,000 during the entire year, you may place all of it into your IRA. That's 100 percent of your annual compensation, should it happen to be such a small amount (as it might be if you worked only part time for part of the year). This change is a great help to two-paycheck families. Now, if both people make at least $2,000 each, they can take full advantage of the tax savings offered.

If your wife is not employed at all during the year, you can contribute a maximum of $2,250. In this situation, you would each have an IRA account but funds would not have to be divided equally between the two accounts as they had to be in the past. If your wife works at all during the year, make sure she works long enough to earn at least $250! If you don't, you will be losing a small amount of tax shelter.

Where do you put an IRA?

When IRAs first came into existence, the general public knew very little about them. As with most things unfamiliar, people had a tendency to approach IRAs with great caution. The banks and savings and loans were quite sensitive to these feelings and began advertising the availability of IRAs as one of their many services covered by insurance.

There seem to be a handful of magic words in the money world that attract normally cautious people just as a fat, juicy worm wriggling on a hook attracts a hungry fish. The service available was an IRA account, but the bait was the advertised insured safety of your funds. As a potential IRA account customer, you are the fish that banks hope to lure into doing business with them. They know you will have to leave your money in the IRA account for a number of years. They are banking on the likelihood that you'll leave your account with them until you retire.

Banks and savings and loans offered two types of IRAs, contributory and rollover. To a contributory IRA, additions can be made either periodically on a regular basis throughout the year or in lump sum amounts. Automatic payroll deductions are available at most credit unions. Dividends on this type of account are generally stated as being compounded and paid quarterly.

A rollover IRA accepts funds from an existing IRA or previous employer retirement plan, without the loss of tax-deferred status. In the banks and savings and loans, this money is usually invested in a form of certificate that earns dividends at the opening rate for the fixed term of one year. In most institutions, dividends in a rollover IRA are compounded and posted monthly and at maturity.

In the early days of IRAs, the banks and savings and loans had a large share of the IRA accounts. As the IRA program became better known and understood, people began to become aware of independent trust companies and insurance companies as possible vehicles for their IRAs.

There are numerous independent trust companies that specialize in administering self-directed retirement plans. A self-directed IRA allows you to have a voice in the way your IRA funds are invested. You may direct the trust to invest in publicly traded securities that have been registered with the Securities and Exchange Commission (SEC) for interstate sales, money market funds, certain limited partnership interests, certain real estate investment trust units, covered call options, mutual funds, short-term money market instruments including Treasury bills and notes, annuities issued by commercial insurance companies, certain certificates of deposit (CDs), and passbook savings.

This arrangement gives you considerably more flexibility, since you may direct the trust to reposition a portion of your IRA funds from time to time as the market fluctuates. This maneuverability allows you to spread your interests across several areas at once; it gives you the opportunity to put your investment eggs in more than one basket.

Certain types of investments of your IRA funds are not allowed, primarily because of the additional risk element. The disallowed list includes real estate that's not part of a qualifying REIT (Real Estate Investment Trust); commodities or futures contracts; foreign currency; limited market debt obligations, such as hospital bonds; privately held securities (including some securities which are considered closely held); short sales; margin account purchases; mortgages and deeds of trust; life insurance; and collectibles such as coins, jewelry, art objects, and precious metals.

There's been a lot of talk about tax savings with an IRA. What does it mean for you? Uncle Sam is helping you plan for your retirement. How much he helps depends on whether or not you choose to have an IRA as well as on your tax bracket.

It works like this. Multiply your tax bracket by 2,000 to find the amount of your tax savings. Your net cost will be $2,000 minus your tax savings. To find out how

TAX BRACKET	ANNUAL INVESTMENT	TAX SAVINGS	YOUR NET COST	FOR EACH $ YOU PUT IN UNCLE SAM "CONTRIBUTES"
20	2,000	400	1,600	0.25
30	2,000	600	1,400	0.43
40	2,000	800	1,200	0.67
50	2,000	1,000	1,000	1.00

Figure 1.

much Uncle Sam contributed for each $1 you put into your IRA, divide your tax savings by your net cost. Examples are shown in Figure 1.

As you can see from the numbers, you can save as much as $1,000 in taxes by investing in an IRA. Of course, you must be in a 50 percent tax bracket to realize that much savings, but whatever your bracket, it's nice to know you are sending less money to Washington.

It would be fantastic if you could set aside those quarters or half dollars or whatever it turns out to be into another investment of your own instead of giving the money to Uncle Sam. "But," you say, "I don't have $2,000 now and the year's almost over!" A lot of people around the country today are probably saying the same thing. Of some fifty million wage earners in America who are eligible to have an IRA, only about half that number have taken advantage of the opportunity to shelter $2,000 of their income from current taxes.

For many of us, making a big lump sum payment of $2,000 at this time of year can be quite difficult. It can be doubly difficult for the two-paycheck family, as they have a potential total contribution of $4,000 between the two of them. Many large companies will cooperate by making automatic payroll deductions for you. Some banks will make automatic periodic transfers from your checking account to your IRA in a manner similar to that used for automatic payment of standing monthly bills such as a mortgage payment.

Although the calendar year is almost over, most of us have until April 15 of each year (that's the usual income tax return deadline, remember?) to place funds into our IRAs. Even if you can't spare the entire $2,000 now, don't give up totally the possibility of funding your IRA for 1982. Some tax savings is better than none at all.

Count the number of weeks left between now and April 15. Decide how much you can set aside each week and do it. While you're at it, make your plans now for funding your 1983 IRA contributions. To give you an idea of how much money it takes on a weekly basis, divide $2,000 by 50 weeks. That gives you at least two vacation weeks to play with. On a weekly schedule, then, you would need to have $40 withheld from your paycheck.

Once you get used to having those funds earmarked for your IRA, you'll find it's quite possible to budget the rest of your expenses with what's left. Pay yourself first! You deserve more than the leftovers!

After you have figured out a way to fund your IRA you will need to start thinking

Softalk's Top Thirty shows clearly that pc owners take their computer seriously. They buy spreadsheets and word processors and databases and languages and such somber-sounding programs as *Macro Assembler* and *Asynchronous Communications Support*. Happily for a little group of gnomes at *Softline* magazine, some pc owners also buy such bizarre sounding programs as *Deadline*, *Zork*, *Crossfire*, and *Pig Pen*.

For those of you who wear green eyeshades and sleeve garters at work, *Deadline*, *Zork*, *Crossfire*, and *Pig Pen* are games. And for those of you who think computing can be fun as well as profitable, you've been missing *Softline*, the computer gaming magazine that already covered those games and many more for the Apple and Atari computers. Now *Softline* is zeroing in on the hot new games for the pc.

Softline takes games seriously, just as green-eyeshade types take bottom lines seriously. *Softline* is fun and serious, light and weighty, small and bimonthly.

It's also inexpensive. For a brief time, you can get the next six issues for $9 (normal price $12). If you've been following inflation, you know which way the price will move next.

Don't let those Apple and Atari guys have all the fun. Spice up your pc's RAM with *Softline*.

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SOFTLINE

	A	B
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2	INTEREST	
3	PERIODS	
4	AGE	
5	RETIREMENT	
6	TERM	+B5−B4
7	INT/PERIOD	+B2/B3/100
8	FUTURE VALUE	+B1*((1+B7)^(B6*B3))
12	0	+B1
13	+A12+1	+B1*((1+B7)^(A13*B3))

Figure 2.

about where you want to put it. If you already have an IRA but have just discovered you could do better by placing it somewhere else, all is not lost. Once you have selected the new trustee for your IRA, you can move your existing account funds without incurring any tax consequence. This type of transfer is called Transfer of Assets without Constructive Receipt and is actually a transfer of trustee. No cash from the IRA enters your hands as a result of the transfer.

The first year you have an IRA, you will only have $2,000 to invest. It's a little difficult to be very diversified with this amount, so you may want to take a closer look at mutual funds. The next year you'll add an additional $2,000 and will have an even wider selection of possible investment vehicles from which to choose. As your IRA grows, you may find movement into a real estate investment trust or an oil and gas investment of interest to you. Just as with your other investments, your IRA account holdings should be diversified to spread your risk.

By this time you may be wondering if having an IRA is really worth it. Let's use our handy computer and electronic spreadsheet to play a few number games. You will want to have a pretty good idea of your tax bracket. The second major factor is the number of years until you reach retirement.

The first thing we will do is set up an area near the top of the sheet to hold items we'll want to use for playing "what if?" Next we'll display the growth of a single $2,000 investment for at least the number of years until your retirement.

Enter the data shown in figure 2, using a global dollar-and-cents format and column widths of 12. You'll probably want to override the dollar format at B3 through B7. You'll find as you develop this model that recalculations take a long time; that's because the formula at B8 involves exponentiation. You might want to set your spreadsheet program to manual recalculation, if that option is available.

Your variables will be held in B1 through B5. For illustrative purposes, we'll assume that you're thirty-four and planning to retire at sixty-five, that you're going to invest $2,000, and that your money will earn 11 percent interest compounded daily.

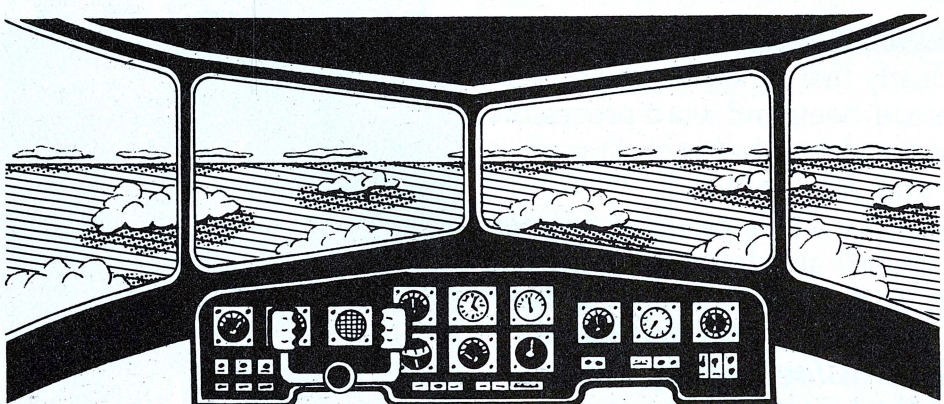
Calculating the future value of an investment can be mind-boggling. Think of the annual investments in your IRA as representing a right triangle. At the top point of the triangle you have zero, before investment begins. At the next level down from the top, you have the value of a single investment held for one year. At the next level down, you have the value of that investment held for two years, and so on down to the lower left corner of the triangle, which represents your single investment held for the longest number of years you wish to calculate.

You can watch that money pile up by replicating cells A13 and A14 down to, say, A56 (or however far you want to take them). When you do that replication, leave the references to B1 and B7 unchanged, and make the references to A12 and A13 relative.

The number at B8 represents the future value of a single $2,000 investment held until retirement. To calculate the growth of your investment if you deposit an additional similar amount each year, all that's required is to sum up column B over the number of years of your investment, beginning with B13 (not B12!).

Begin in column C by typing +B1 at C12 and +B13 at C13. At cell C14, type @SUM(B13.B14). Still at C14, replicate to C56; leave the reference to B13 unchanged and make the reference to B14 relative.

You can display in column D a starting age and decrement the age down the column to show at a glance how much money you can accumulate depending on how old you are when you start the account. At D12



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enter a flush right format and then replicate the format down to D56. Then put the value 72 in D12, and the formula +D12−1 at D13. Now replicate D13 into D14 through D56, with relative reference to D12. You will see your age decrease down the column.

It would be interesting to know how much tax savings you can realize as a result of having an IRA. This information is easy to obtain. Let's suppose you're in a 39 percent tax bracket. At D2 enter the label TAX RATE and at E2 enter .39 to express your rate as a percentage.

You're now ready to see how much money you can save in current taxes with an IRA. You can do this in column E by calculating the after-tax effective value of a non-IRA investment (we'll assume your non-IRA investment returns the same interest as your IRA).

A	B	C	D	E	F	G
PRINCIPAL	2000.00					
INTEREST	11.00		TAX RATE	0.39		
PERIODS	365					
AGE	34					
RETIREMENT	65					
TERM	31			AFTER-TAX	ANNUAL	SINGLE
INT/PERIOD	3.013699E−4			EFFECTIVE	AMOUNT	AMOUNT
FUTURE VALUE	2232.52			VALUE OF	−	−
		CUMULATIVE	STARTING	NON-IRA	TAXES	TAXES
YRS	SINGLE INV.	INVESTMENT	AGE	ACCOUNT	PAID	PAID
0	2000.00					
1	2232.52	2232.52	71			90.68
2	2492.07	4724.59	70	2141.84	191.91	101.23
3	2781.80	7506.39	69	3752.68	304.90	112.99
4	3105.21	10611.60	68	6421.49	431.03	126.13
5	3466.22	14077.82	67	9400.57	571.83	140.79
6	3869.20	17947.02	66	12725.99	728.99	157.16
7	4319.03	22266.05	65	16438.03	904.42	175.43
8	4821.16	27087.21	64	20581.63	1100.25	195.83
9	5381.67	32468.88	63	25206.96	1318.85	218.60
10	6007.34	38476.22	62	30370.03	1562.86	244.01
11	6705.75	45181.97	61	36133.36	1835.24	272.38
12	7485.36	52667.33	60	42566.73	2139.29	304.05
13	8355.60	61022.93	59	49748.04	2478.69	339.40
14	9327.02	70349.95	58	57764.25	2857.54	378.85
15	10411.38	80761.33	57	66712.41	3280.44	422.90
16	11621.80	92383.13	56	76700.89	3752.50	472.06
17	12972.95	105356.08	55	87850.63	4279.45	526.95
18	14481.18	119837.25	54	100296.63	4867.66	588.21
19	16164.75	136002.01	53	114189.59	5524.25	656.59
20	18044.06	154046.07	52	129697.75	6257.18	732.93
21	20141.86	174187.92	51	147008.88	7075.32	818.14
22	22483.54	196671.46	50	166332.60	7988.58	913.26
23	25097.47	221768.93	49	187902.88	9008.01	1019.43
24	28015.29	249784.22	48	211980.92	10145.96	1137.95
25	31272.34	281056.56	47	238858.26	11416.21	1270.25
26	34908.05	315964.61	46	268860.35	12834.14	1417.93
27	38966.44	354931.05	45	302350.47	14416.91	1582.77
28	43496.67	398427.72	44	339734.14	16183.70	1766.79
29	48553.57	446981.29	43	381464.02	18155.89	1972.19
30	54198.39	501179.69	42	428045.40	20357.37	2201.48
31	60499.48	561679.16	41	480042.31	22814.80	2457.42
32	67533.12	629212.29	40	538084.37	25557.92	2743.12
33	75384.50	704596.79	39	602874.37	28619.95	3062.04
34	84148.67	788745.46	38	675196.83	32037.98	3418.03
35	93931.77	882677.23	37	755927.48	35853.39	3815.41
36	104852.24	987529.46	36	846043.84	40112.37	4258.98
37	117042.32	1104571.78	35	946637.09	44866.50	4754.13
38	130649.61	1235221.40	34	1058925.28	50173.35	5306.85
39	145838.89	1381060.28	33	1184268.05	56097.17	5923.82
40	162794.06	1543854.34	32	1324183.12	62709.68	6612.52
41	181720.43	1725574.78	31	1480364.66	70090.97	7381.29
42	202847.18	1928421.96	30	1654703.81	78330.40	8239.43
43	226430.12	2154852.08	29	1849311.56	87527.75	9197.35
44	252754.80	2407606.88	28	2066544.33	97794.37	10266.62
				2309032.51		

Figure 3.

Then, at cell E14 enter this formula: +C13−(E2*(C13−C12)); then replicate the formula to E56, with the reference to E2 unchanged. This formula gives you the after-tax yield for an investment that, unlike an IRA, is not exempt from taxes.

In column F we can calculate the amount of taxes that would be paid on a non-IRA account with an annual investment. At F14, enter the formula +E2*(C14−C13−B1); then replicate the formula to F56, with the references to E2 and B1 unchanged.

In column G we can calculate the amount of taxes that would be paid on a non-IRA account with a single investment (the value at B1). At G13 enter the formula +E2*(B13−B12) and replicate that formula to G56—again keeping a constant reference to E2.

Figure 3 shows the finished model, complete with some additional labels.

You can now readily compare the tax effectiveness of an IRA to a nonexempt investment; and you can change the various parameters to see their effects. An interesting variation would be to change the tax bracket after every five-year period or so to reflect your increased income tax liability. Have fun! ▲

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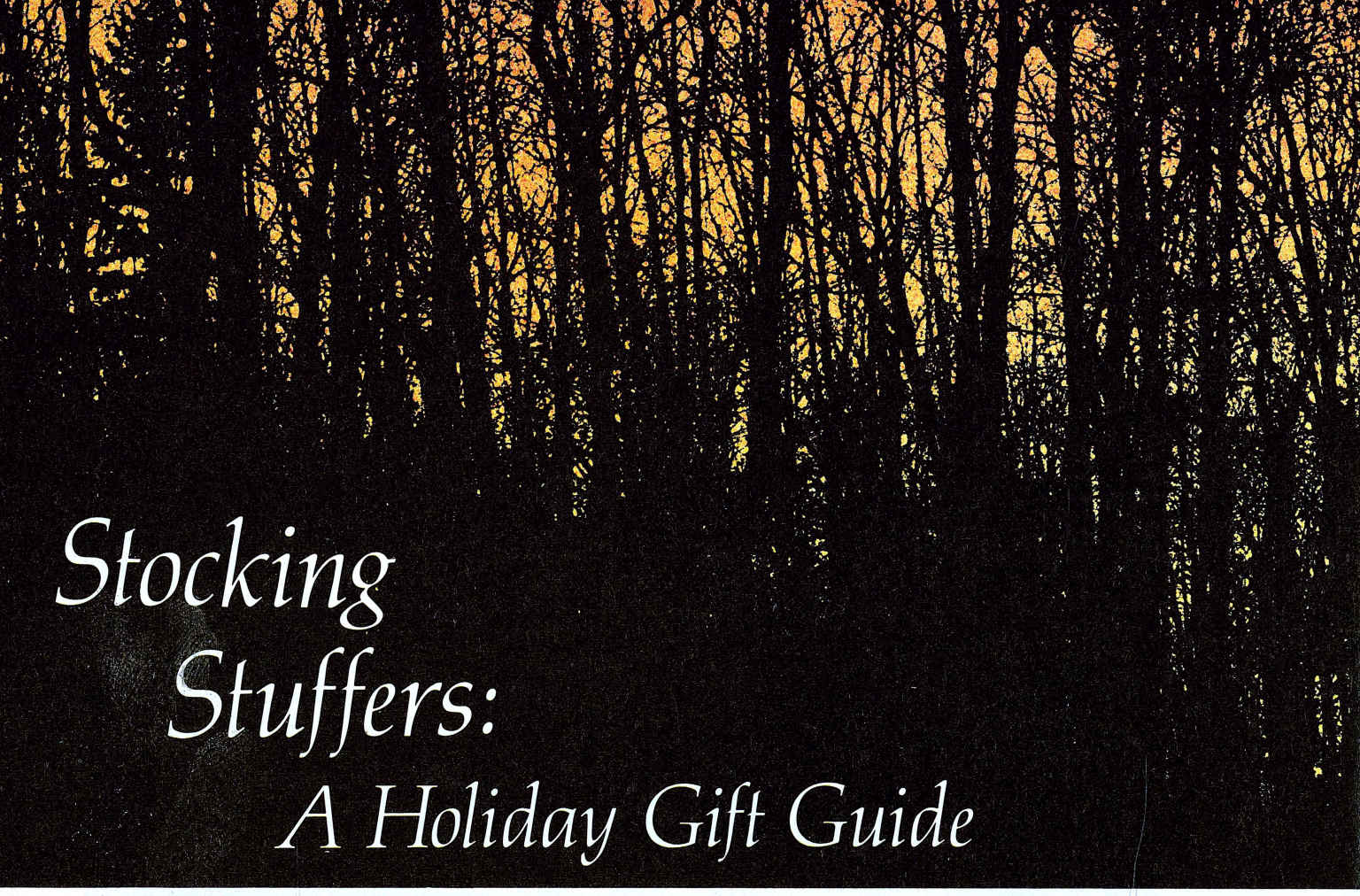


Stocking Stuffers: A Holiday Gift Guide

Got a pc-owner on your gift list? Here's the first annual Softalk/IBM holiday gift guide, a directory of smart stocking stuffers for that special person.

We've asked software publishers and manufacturers of hardware products for the pc to send us short descriptions of items they think pc owners might like for Christmas. We haven't tested all of these products, and we leave it to you to determine their suitability for your gift-giving needs.

Unless an item says otherwise, you can assume that the software described here runs in 64K and requires one disk drive, either display adapter, and PC-DOS (1.0, 1.05, or 1.1).

It's our hope that you'll find the perfect gift in these pages—even if your special someone is you. Good shopping, and have a very happy holiday!

HOME

Acorn Software Products, Vienna, VA

Money Manger, by Andrew Bartorillo. Manage your household income and expenditures by setting up a checkbook file in which you can define up to ninty-nine categories of expenses, bank transactions and income, including a file for tax deductible expenses. Requires eighty columns. $39.95.

Arlington Software and Systems, Arlington, MA

PCHMS—The Personal Computer Home Management System. An integrated, menu-driven filing and information system for organizing and managing personal business, and household data. Includes printing calculator, memo/letter writer, date and digital display with alarm, metric converter, and state/area code directories. All files can be password protected and can be displayed as forty or eighty column screens. $89.95.

Artificial Intelligence Research Group, Los Angeles, CA

Eliza. A full implementation of the original *Eliza* program for the IBM Personal Computer. Created at MIT in 1966, *Eliza* turns your computer into a nondirective psychotherapist. It's the world's most celebrated artificial intelligence demonstration program. Protected version, $25; unprotected Basic source program, $45.

Compu-Quote, Canoga Park, CA

COINS (Computerized Inventory System). The collector may

enter information on the coins in his or her collection effortlessly and produce various printed reports that can be used for personal investment and tax purposes. Requires two disk drives and a printer. $95.

Design Data Systems, Cedar Rapids, IA

Home Finance Program. Consists of four basic modules: monthly budget analysis, checking account analysis, savings account analysis, and loan amortization analysis. For best results you need a printer. $100.

Digital Marketing, Walnut Creek, CA

Cardfile, by Pro-Tem Software. Stores, retrieves, and displays information that is typically kept in index card files: summaries of articles and books, notes, menus, catalogs of books, phonograph records, and tapes. Endless uses. Data is entered through your own text editor. Allows twenty-one lines per file record; the first three are key lines. $89.

Electronic Data Systems, Richardson, TX

Personal Tax Planner. Make doing your taxes easy. Simply answer the questions, step by step. Here is a planning device that calculates and recalculates all the math, automatically calculates income averaging, stores a tax model to do what-ifs, provides complete tax summaries, and musically lets you know of your standing with the IRS. $49.95.

Norell Data Systems, Los Angeles, CA

Computer Chef, by James Gillogly. An automated recipe file and computerized cookbook that saves you time and money. It will search through your recipe collection to find just the one you need. Calculates the amount of each ingredient needed to increase or decrease the number of servings the recipe makes. $49.95.

PCsoftware, San Diego, CA

Creatabase. Create, update, and print any file. Up to sixteen fields. Prints lists, labels (four across), or any forms. Key fields for fast access. Select any particular records to edit or print. Requires two drives. $59.95.

SimSoft, Marysville, MI

Dietary Analysis Program. Analyzes your daily food consumption for vitamin, mineral, and caloric content. $29.95.

Software Laboratories, Dublin, OH

Home Package. Household property list, credit card register, shopping list, biorhythms, contact sports (adults). $20.

Spectrum, Sunnyvale, CA

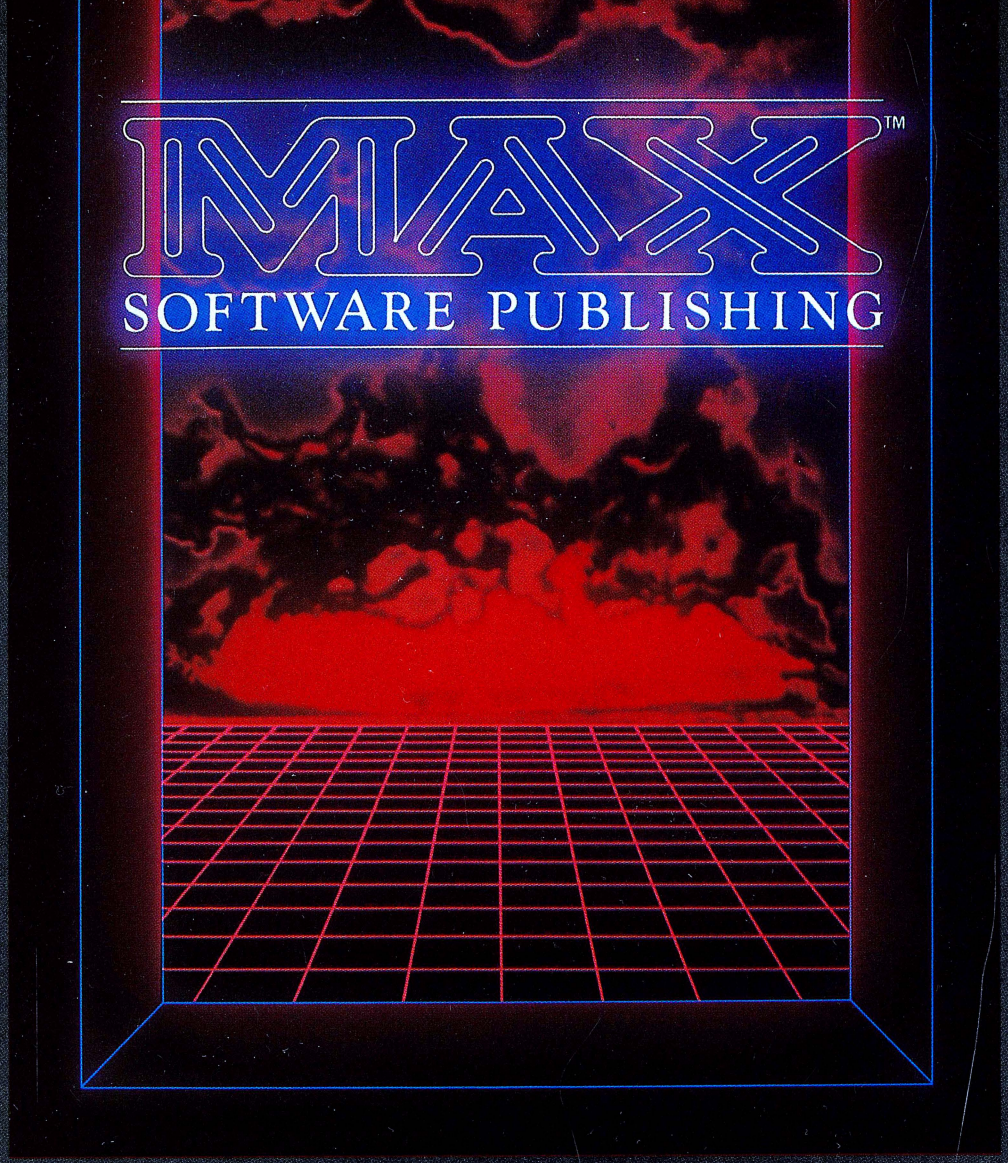
Personal Finance Master (PFM). A comprehensive, easy-to-use financial management system. Employing easy-to-read, on-the-screen forms for convenient data entry and review, the system tracks and manages up to twenty-five different asset or liability accounts. $75.

SuperSoft, Champaign, IL

Personal Data Base. Easy-to-use database for a wide variety of business and personal applications. $125.

Virtual Combinatics, Rockport, MA

Micro Cookbook, by J. Butler and B. Skiba. A computerized cookbook complete with over 150 tasty international recipes and reference material. Menu driven, easy to use, and ultrafast. Enter or modify recipes using preformatted screens; even create your own cookbooks. $40.



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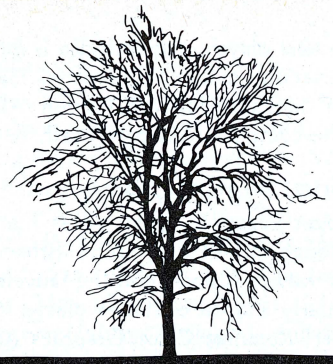

GAMES

Shagbark Hickory

Acorn Software Products, Vienna, VA

Everest Explorer, by William Godwin and Don Knowlton. A simulation of an expedition to reach the summit of Mount Everest. Requires eighty columns. $19.95.

Lost Colony, by David Feitelberg. A complex resources-management simulation in which the player is the economic manager of Earth's first space colony. Requires eighty columns. $29.95.

Aeon Concepts, Pittsburgh, PA

Microcosm. A strategic and analytical game that simulates birth, death, and migration among populations of microbes. In solitaire modes, explore the fascinating evolution of patterns through generations. In competition modes, sabotage your opponent's colony while yours flourishes. Store patterns, preview future generations, even change the rules for countless variations. $39.95.

Alkazar Associates, Arlington, VA

Game Master. Provides sophisticated dice rolling and bookkeeping for gamers, especially those engaged in role playing and war games. Advanced version includes chart rolling and other powerful commands. Basic version, $19.95; advanced version, $24.95.

Alpha Software, Burlington, MA

Question. Think of an animal, city, or famous person. The computer tries to guess what you are thinking of. Teach the computer as many new items as you like—even new categories for play. Ideal for all ages because it becomes as smart as the person playing, and it takes less than five minutes to learn. Comes with spoken instructions. $45.

Armonk, Newport Beach, CA

Executive Suite, by Gray Flannel Fun. One of a series of games for executives in which they are challenged to rise to the executive suite at Mighty Microcomputer Corporation. $40.

Broderbund, San Rafael, CA

Apple Panic, by Ben Serki. The apples will get you if you don't watch out! Forced to flee from pursuing apples in a multi-level mansion, you set traps for your pursuers along the way. Requires graphics adapter card. $34.95.

Conversions To Go, Carlsbad, CA

Quadrant 64. This game paints a sixty-four-quadrant galaxy. A quadrant scan shows you your ship, the stars, the starbases, and the enemy. You can use torpedos or a disruptive beam to destroy the enemy in a given time period. $29.95.

DataMost, Chatsworth, CA

Pig Pen, by TMQ Software. Watch out! The Oinks are on the loose in the cleverest switch in the maze craze. The fierce, wild pigs are searching for you. Requires graphics board. $29.95.

Space Strike, by Mike Abrash. You're stationed on a remote asteroid, part of the welcoming committee for a new race of aliens. To your horror, you soon discover that they believe the only good Earthling is a dead Earthling. Requires graphics board. $29.95.

Davell Custom Software, Cleveland, TN

Milky Way Merchant. A trading strategy game for up to four players, ages eight to adult. Best strategy changes as game progresses. Watch star systems develop, or see productivity decline and entire civilizations collapse. $29.

Digital Marketing, Walnut Creek, CA

Astro-Dodge, by Dave Gangola. A fascinating space-action game. The object is to score points by destroying meteoroids and ships. Requires a color graphics card and separate black-and-white or color monitor. $39.95.

Distributed Software Systems, Northbrook, IL

Flipper-Ball. Fast-paced video pinball games for one or more players. Exciting sound and graphics give you the feel of a real pinball machine. $29.95.

Ensign Software, Boise, ID

Games Package I. A collection of ten great games to play. These games turn the computer into a fun machine for the whole family. Includes games for both youngsters and adults: Qubic, Othello, Kingdom, Cribbage, Black Box, Space Trek, Blackjack, Master Mind, Americans Quiz, and Presidents Quiz. $29.95.

Epyx/Automated Simulations, Sunnyvale, CA

Temple of Apshai. Perform heroic deeds in a labyrinth filled with treasures, traps, and monsters. Animated color graphics portray the temple and all its contents—magic, monsters, doomed cities, and damsels in distress. $39.95.

Upper Reaches of Apshai. This is the first in a series of expansion modules for *Temple of Apshai.* You'll adventure through four new fun levels and over 150 rooms, gardens, berry patches, and caverns. $19.95.

Curse of Ra. Second in a series of expansion modules for *Temple of Apshai,* it takes you on a journey into the deserts of ancient Egypt. The cobra, the jackal, the mummy, and more all roam freely about more than 100 chambers. Each with but one purpose. $19.95

IBM, Boca Raton, FL

Microsoft Adventure. The classic text-adventure program. Requires 32K. $30.

Microsoft Decathlon. Allows players to compete in a simulation of the famous ten events of track and field competition. Requires Color/Graphics Adapter. $35.

IDSI, Las Cruces, NM

Pool 1.5. A real-time color simulation of pool. Features precise physics, instant shot replay capability, cue ball English selection, and much more. *Pool 1.5* allows play of eight-ball, rotation, nine-ball, and straight pool. Color adapter required. $34.95.

Info-Pros, Irvine, CA

Galaxy Master. A video action space game that selects either action sound or no sound for the office environment. The game automatically determines whether to run in color graphics mode or text mode for the monochrome display, and it uses the twenty-fifth line of the display as a scoreboard. Requires eighty-column display. $14.95.

Intelligent Statements, Holmes, PA

Ken Uston's Professional Blackjack. The most complete teaching system available; can help you win at blackjack. Play at over seventy preprogrammed casinos according to their unique rules. Flash card and drill sections will teach card counting methods and improve skills. $89.95.

International Software Marketing, Syracuse, NY

Prism, a Storydisk. The hunt is on for three priceless gold keys hidden somewhere in the continental U.S. Hidden in three separate locations are a diamond key, a ruby key, and a topaz key. All the clues needed to find the keys are contained in the story of *Prism.* Also a surprise climax to the adventure will be revealed when all three keys are recovered. Requires Color/Graphics Adapter. $24.95.

Gary Irwin and Associates, Irvine, CA

Barrier, by Chris Thames. A two-player game in which each player tries to block his opponent, causing him or her to run into walls, your barrier, or their own barrier. Requires color/graphics adapter. $40.

Star Chase, by Chris Thames. Picture yourself in the cockpit of a starship, and your mission is to destroy enemy ships. Each laser shot will cost you fuel. Select a speed factor of one to five as you graduate from fledgling to eagle. Requires color/graphics adapter. $40.

Honeycomb, by Chris Thames. You control a light shield that will prevent a bee from striking the center area of the screen. Try to clear the screen of cells before you receive five stings. Requires color/graphics adapter. $40.

Ivy Research, New Haven, CT

Slynx, by Steven L. Wagar. Each bite of food scores, but also adds bytes to Slynx's length, an impedimental factor. Slinking through the ivy corral, he must steer clear of his own tail and of the boundaries while scoring. Ten speeds and exclusive score-saver. $34.95.

Viper, by Robert D. Glaser. Seize the gold, elude the viper, escape through the home passage when it appears. Progressive version has five phases; the last is the most challenging as the board shrinks, a black hole appears adding danger, but possible reward. Speed race version adds a time element to the hazards. Score-saving feature included. $29.95.

Norell Data Systems, Los Angeles, CA

The Hermit's Secret, by Dian Girard. Can you outwit the hermit? Work your way through the mind-challenging puzzles in this adventure and find out. $24.95.

The Phantom's Revenge, by Dian Girard. Treasures, puzzles, and danger are waiting for you. Over a hundred rooms, a fascinating and challenging adventure. $24.95.

The Original Adventure, by James Gillogly and Walt Bilofsky. Dare the dangers of Colossal Cave with the original adventure game. $24.95.

Omric, Newington, CT

Space Guardian. Warships from a hostile alien empire have invaded the galaxy, destroying most of Earth's galactic fleet. As commander, you must find and destroy all the alien warships before it is too late. Only your strategic skill can save Earth. $29.95.

Blingsplatz! In this real-time, arcade-style game, your space outposts are under continuous attack by the Blingsplatz. With each new attack the game gets more difficult. Fully keyboard controlled. $34.95.

Champion Draughts. This version of checkers will challenge even the best checkers player. Also included is *International Draughts,* an interesting variation on this old favorite. The player can select different levels of difficulty for each version. Allows play between two people, or the computer can play itself. $34.95.

PC Connection, Marlow, NH

Hoser, by Roger Ferguson. Just try to maneuver a winding, twisting *hose* through fifteen amateur or fifteen professional *yards* (screens) on your way to filling up at the faucets. But don't hit the borders or irregularly shaped obstacles placed in your way before the timer goes off! Requires Color/Graphics Adapter. $25.

PCsoftware, San Diego, CA

Championship Blackjack. The best blackjack game around. Supports monochrome and full color. Up to six players, realistic table layout, fully selectable rules, player statistics, two playing strategies, computer players. $34.95.

Professional Software Associates, Minneapolis, MN

Anaconda, by Craig Warner. You're a hungry anaconda searching the jungles for lunch. As you eat, you grow longer and longer—but be alert. Ten skills levels; play by yourself or challenge another anaconda. Records high scores and player rankings. $19.95.

Quala, San Fernando, CA

Las Vegas Blackjack. If you can beat this game, you can win at the tables. A faithful reproduction of Las Vegas Strip blackjack, including multideck play, splits, double down, and insurance bets. Teaches card counting with any card weight and keeps a running count. Requires eighty columns. $39.95.

SCC Games, Burke, VA

FlippinGame. A challenging version of reversi. Two levels of difficulty, beginner and advanced. Designed for monochrome monitor; will run on color monitor. $19.95.

Science Research Associates, Chicago, IL

Cross Clues. A mind-challenging word game in which the computer umpires while two opponents compete to uncover hidden words. Beat the clock while coaxing clues from the computer. $29.95.

Sirius, Sacramento, CA

Call to Arms, by Mike Falkner. A battle of wits and strategy for two to four players, featuring maps of Europe in 1942 or Scotland in 1750. Color card required. $29.95.

Software Laboratories, Dublin, OH

Fun Package. Offers *Tic-Tac-Toe, Lucas Puzzle, Slot Machine, Dice Roller,* and *Number Guess.* $20.

Stock Market Game. Simulates trading on the stock exchange from year to year. Three categories of stocks. Market movements occur randomly. $10.

Drag Race. Design the car of your choice in either the unlimited dragster, pro stock, or stock racing classes. One to three players. Race against friends or the computer. Uses factual car design information. Interesting and challenging. $10.

Systemics, West Bloomfield, MI

Pro-Pick. Professional football predictions, taking only minutes per week to update the latest scores. Customize prediction method based on your own ideas on home versus away. Schedule for 1982 included; use software year after year. Examine point spreads, total points, and print or display your results. Requires two drives and monochrome display. $75.

TexaSoft, Dallas, TX

The Queen of Hearts Maze Game. Make your way around a maze to find the queen's missing cards while avoiding crazy card sharks. Play the trump and turn the tables on them. With music, sound, and varying levels of difficulty. $35.

Trilogy—Three Games of Middle Earth. Three games of action and adventure set in Middle Earth, where dwarfs and orcs fought for lost treasure and dragons ruled the sky. Adapted from the mainframe 1977 version. Music and sound. $35.

Set the Hostages Free. Ninety hostages are in a terrorist's prison and you have been sent to free them. You must break through the three-layered wall while avoiding menacing guards. Varying levels of difficulty. Music and sound. $35.

GRAPHICS

Sassafras

ABW, Ann Arbor, MI

RL-1 Graphics Processor. Allows data from the *RL-1 Database* to be displayed graphically. Compatible drivers will be available for the Personal Computer (both monochrome and color outputs), Tektronix 4010, Houston Instruments DMP plotters, and many other graphics devices. Additional drivers will be available separately. This package is compatible with all other *RL-1* packages. Requires *RL-1 Relational Database,* 96K, and two disk drives. $125.

Diamond Head Software, Honolulu, HI

Stock Charting. Fully utilize your hi-res graphics capability to chart the price/volume movements of securities. Designed for the small investor who is willing to update data manually. Produces a chart of the previous thirty highs, lows, closes, and volumes. Requires color/graphics card and suitable monitor. $49.95.

Ensign Software, Boise, ID

Color Demonstration. Enjoy the color graphics capabilities of the pc with this collection of ten delightful demonstrations. All are accessed from the menu with the function keys, and return to the menu when the escape key is pressed. Includes kaleidoscope, weave, Ensign logo, portrait, stars, prism, string art, 3-D hills, script, and calendar. Requires color/graphics adapter, color display. $24.95.

HP7470 Plotter Demo. Ten demonstration programs for use with a HP7470 or HP7225 plotter. The programs can be modified to serve your particular needs and data. Useful programs and good examples, including birthday plot, twelve-month trend, display slides, digitizer, phone chart, Archimedes spiral, polar functions, and Ensign logo. Requires eighty columns. $24.95.

Graphic Software Systems, Wilsonville, OR

GSS-Kernel. A subroutine library designed for programmers and system builders to allow them to create their own applications using computer graphics. *GSS-Kernel* is both computer and graphics device independent. It is available under the CP/M-86 operating system. Marketed by Digital Research. $500.

GSS-Plot. A subroutine library for programmers and system builders that enables easy generation of two-dimensional plots such as bar, line, and pie charts. *GSS-Plot* is both computer and graphics device independent. It is available under the CP/M-86 operating system. Marketed by Digital Research. $500.

Innovative Software, Overland Park, KS

Fast Graphs. Creates full color charts, graphs, and even company logos for use in business and scientific applications. It takes data from the keyboard or from *VisiCalc, T.I.M.,* or *Fast Facts* files. Then it draws bar charts in two or three dimensions, pie or line charts, and much more. Requires 128K and two disk drives. $295.

International Software Alliance, Santa Barbara, CA

Scrump! by Provost and Associates. A screen-dump utility that dumps whatever appears on a video screen to C. Itoh or Epson printers (others available soon.) Can be chained from a Basic program for dumping graphics created by calling program, and requires only one to two minutes for an average screen dump. $35.

Graph Charting Program, by Daniel Provost. Produces pie charts, line graphs, bar graphs, and histograms. You enter labels and values and program scales data. After screen display, save to disk or call *Scrump!* screen-dump utility to print graph on C. Itoh or Epson dot matrix printers. $59; with *Scrump!*, $75.

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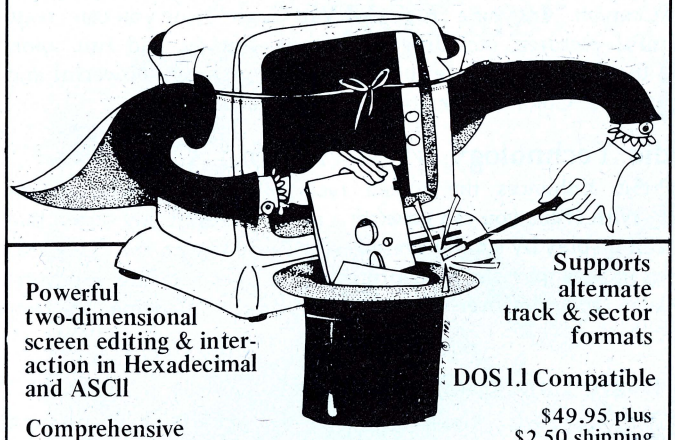

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International Software Marketing, Syracuse, NY

Graphmagic. In a matter of minutes anyone can produce pie charts, bar graphs, line graphs, and scatter grams. Can be used by youngsters or engineers, homemakers or businessmen—it is mastered in minutes and performs with ease. The data for graphing may be entered and edited directly or it can be read from *MatheMagic, VisiCalc,* or any DIF file product. Requires 96K and Color/Graphics Adapter. $89.95.

Micro Control Systems, Vernon, CT

Space Graphics. A software package included with the Space Tablet allows interactive manipulation and editing of points on all three axes. This capability is unique in computer graphics. *Space Graphics* lets you select a point in space and pull it, and all connecting lines, to another location in threespace. Models can be scaled, rotated, and moved about any axis. With Space Tablet, $595.

Chart Pro. Designed to produce bar charts and dot charts on a minimally-configured Personal Computer. Data is input from the keyboard in response to menu prompts. It may also be read directly from *VisiCalc* files. Requires 128K and monochrome monitor. $95.

NorFork Systems, Laurel Springs, NJ

Comp-Art. Draw pictures through easy use of function keys. Automatically generates required code and saves to specified file. Facilities include *circle, line, paint, test,* and *erase.* Requires color/graphics adapter, two disk drives. $59.95.

Omicron, Atlanta, GA

Transplot. Turns your Epson or IBM printer into a graphics plotter. You can have a hard copy of any graphics screen image including x-y plots, bar charts, pie charts, pictures, or other graphics images. 10.7 second screen dump. Demonstration programs and an easy-to-follow user's guide is included. $27.

Plotrax. A friendly, menu-driven plotting program. You can easily switch between menus and the screen graphics with single keystrokes. You can do linear and polynomial regressions and curve fitting, normal (dual or tri-axial) semi-log, and log-log plotting. Includes demonstration files and easy-to-use manual. $135.

PCsoftware, San Diego, CA

PCcrayon. Are you a frustrated Van Gogh? Now you can create beautiful pictures, including movement, sounds, and full color. Save them and reproduce them from any program. Powerful and easy to use. Color adapter required. $44.95.

Radio Technology, West Hartford, CT

PrtSc. Enhances the screen facility of the Personal Computer. With *PrtSc,* you can generate a printed copy of any screen that you can display by simply pressing the PrtSc key on the keyboard. Screen images may also be captured on disk for printing or browsing later. Includes user-selectable forms feed following a screen print. $65.

Software Laboratories, Dublin, OH

Comput-a-Sketch. Draw single-line designs and circles on your screen using the pc keypad. Requires color/graphics card. $10.

Starside Engineering, Rochester, NY

Frieze, by Mark S. Zachmann. Graphics store/dump utility that reads and writes graphics displays to disk, and dumps them to supported printers. Hides itself above DOS and can be invoked from the keyboard or from within a user program in any language. Supports Epson with Graftrax, IDS 460/560/Prism monochrome with graphics, NEC/ProWriter family, and IDS Prism in color for color screen dumps. $55.

Glyphix, by Jeff Duntemann. Graphics scratch pad in BasicA has twenty-seven different commands. Draws in either screen resolution, stores and fetches shape tables, mixes text with graphics at any pixel location, and much more. Built-in interface to *Frieze* utility provides screen save and undo command. Listable and fully commented. Requires Color/Graphics Adapter. $24.95.

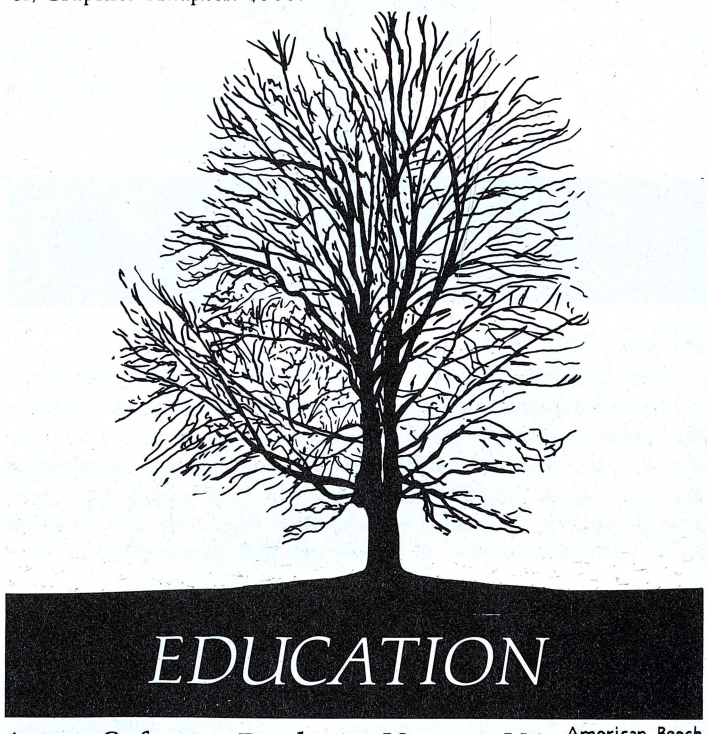
Versa Computing, Newbury Park, CA

VersaWriter Digitizer Drawing System. A graphics system complete with software and graphics tablet that enables entry of graphics to the IBM pc 320 by 200 and 640 by 200 screens. Thirty graphics commands, more than one hundred color options, and printer dump capabilities are offered within the system. $299.

Graphic Hardcopy System. Reproduce IBM screen graphics on CPS Matrix or Epson MX-80 printer with Graftrax. Offers full or one-quarter size printout, reverse or normal inking, density and offset control, and slide show of IBM graphics capabilities. Requires Color/Graphics Adapter. $24.95.

VisiCorp, San Jose, CA

VisiTrend/Plot. Understand relationships between data series, anticipate future trends, and add visual strength to your reports. Automatically produce line, bar, pie, area, x-y, and high/low charts. Performs multiple linear regression, trend-line forecasting, percent change, lead, lag, moving averages, smoothing, and more. Easily interchange data with other Visi programs. Requires 128K and Color/Graphics Adapter. $300.



American Beech

EDUCATION

Acorn Software Products, Vienna, VA

Language Teacher, by Andrew Bartorillo. Each language teacher (Spanish I, Spanish II, and French I—with others on the way) offers hundreds of word combinations, verb conjugations, and phrases. Choose to be drilled from English into the foreign language or vice versa. Option for multiple choice answers plus retest on missed items. Percentage of correct answers monitored on screen. Requires eighty columns. $29.95.

Alkazar Associates, Arlington, VA

Touch Typing Made Easy. Fifteen lessons to free the user from looking at the keyboard while typing. Especially designed for in-home use. $24.95.

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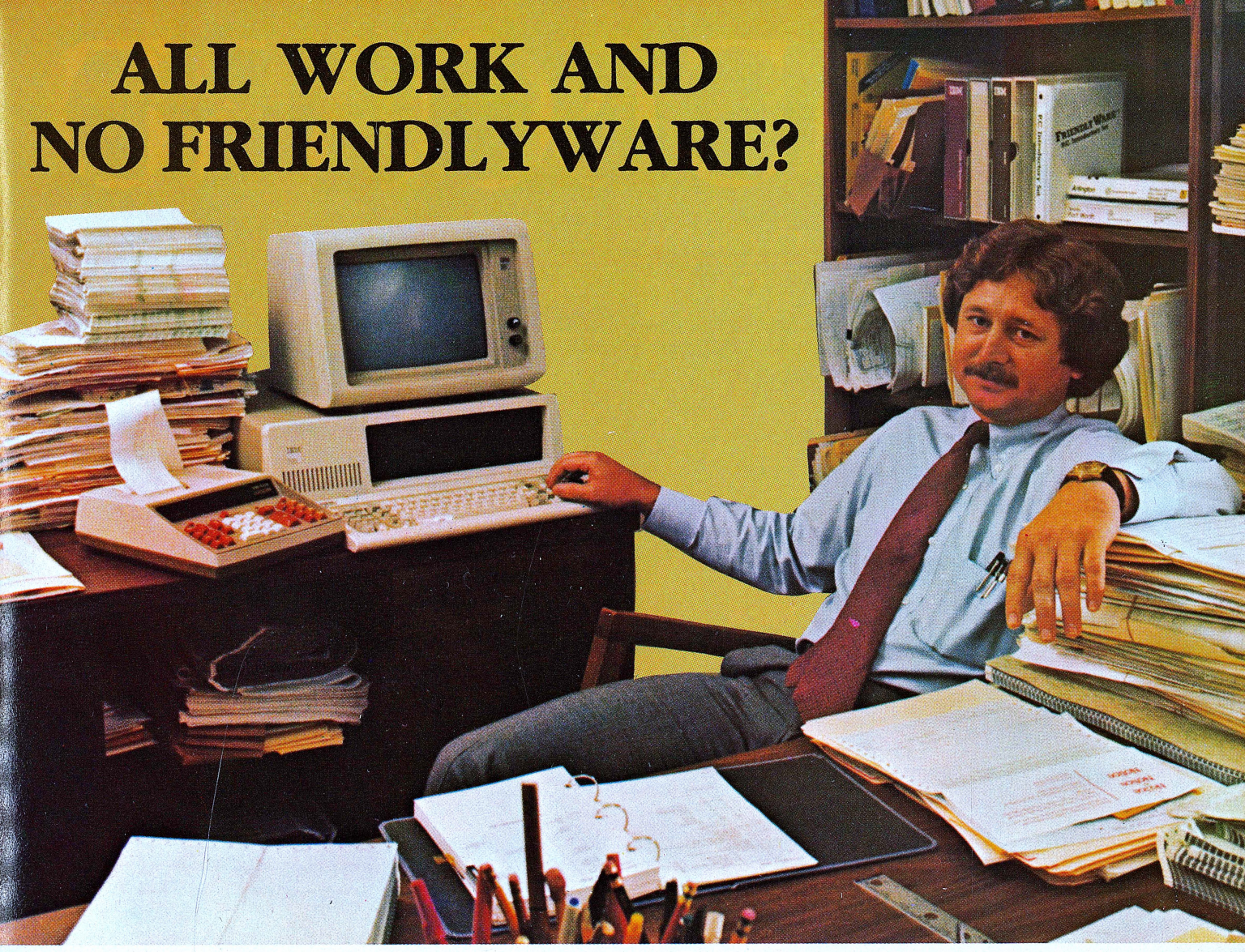

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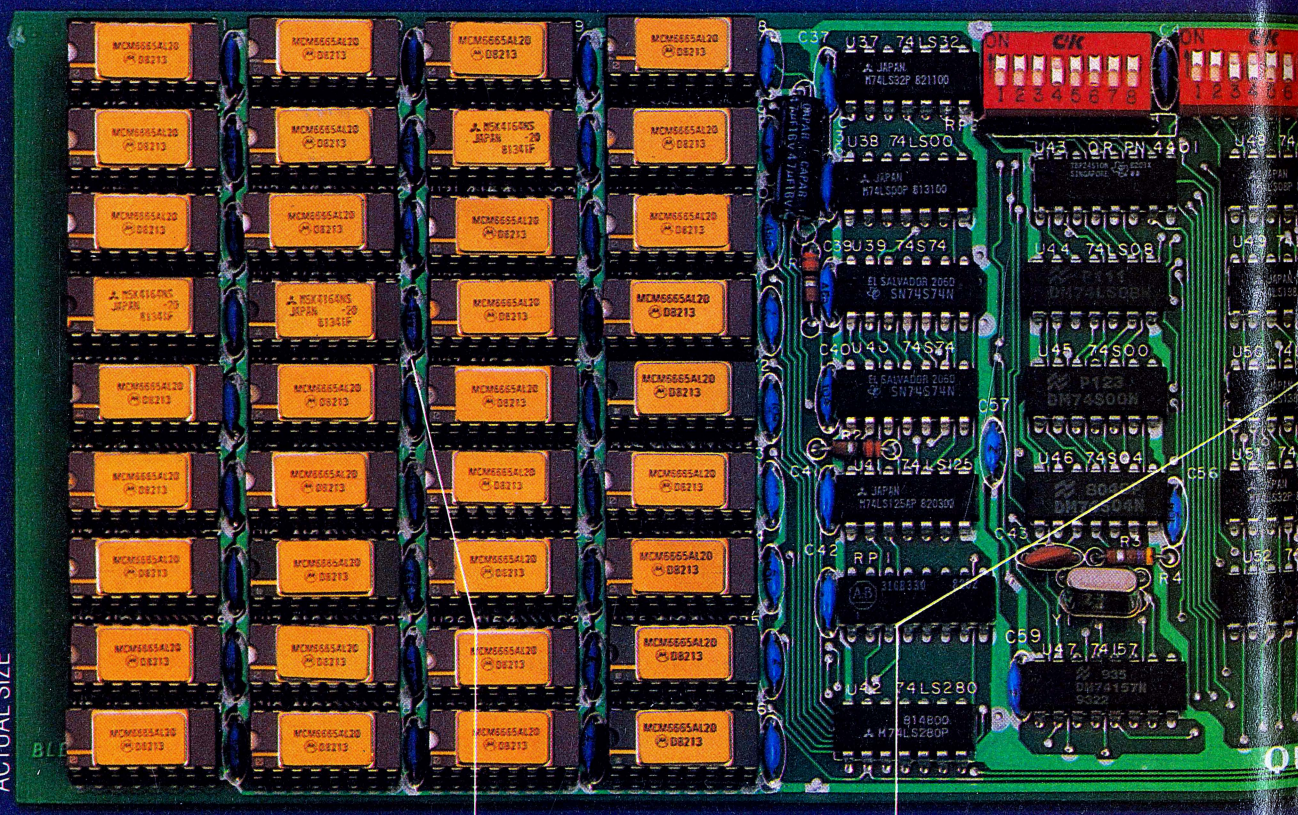

PROVEN DESIGN.
Quadram has been shipping IBM boards with each of the Quadboard functions on separate boards since December, 1981. They are still available as separates (including a Dual Port Async Board) for those who desire a quality board but do not need to keep slots open for future expansion. And they all come with a one year warranty from the leader in technology applications.

256K MEMORY EXPANSION.
Socketed and expandable in 64K increments to 256K, full parity generation and checking are standard. A Quadboard exclusive feature allows parity to be switch disabled to avoid lock-up upon error detection. The dip switches also allow it to be addressed starting on any 64K block so that it takes up only as much as it has memory installed. Memory access and cycle time naturally meet all IBM specifications.

CLOCK/CALENDAR.
Quadboard eliminates the hassle of manually inputting the date on system boot-up by providing for the clock and all software routines necessary for inserting the appropriate programs on your diskettes. The internal computer clock is automatically set for compatibility with most software routines which utilize clock functions. On-board battery keeps the clock running when the computer is off.

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ALL ON ONE BOARD
Now you can utilize all the PC's capacity with Quadram's extremely flexible configurations. And it's totally compatible with IBM hardware, operating systems, and high level languages. It's a full-size board that can be inserted into any free system slot and it even includes a card edge guide for securely mounting the card in place.

SOFTWARE TOO!
With Quadboard you receive not only hardware but extensive software at no extra cost. Diagnostics, utilities, and Quad-RAM drive software for simulating a floppy drive in memory (a super-fast SOLID STATE DISK!) are all part of the Quadboard package.

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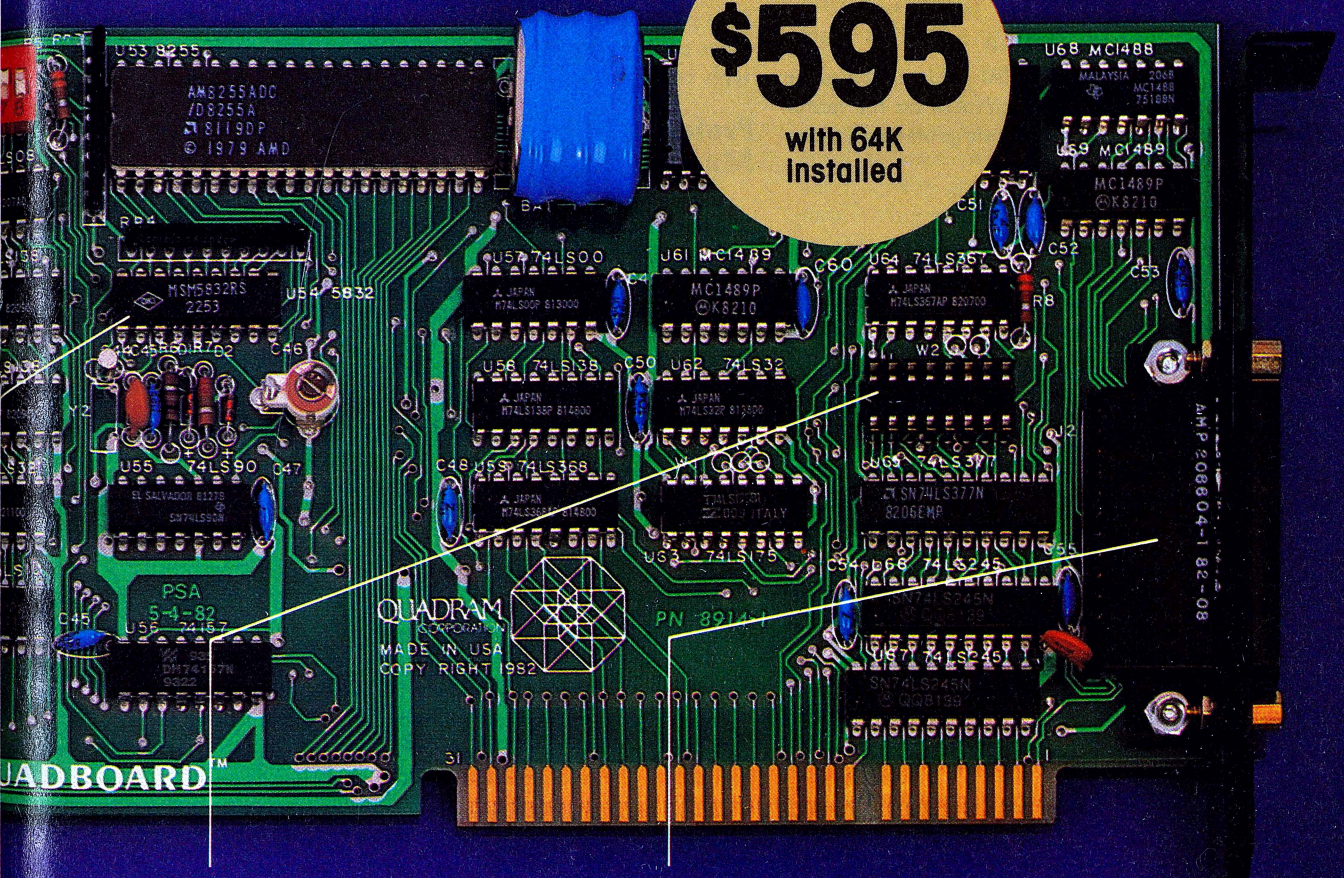
with 64K installed



PARALLEL PRINTER I/O.
A 16 pin header on Quadboard is used for inserting a short cable containing a standard DB25 connector. The connector is then mounted in the knock-out hole located in the center of the PC backplane. The parallel port can be switch disabled or addressed as Printer 1 or 2. No conflict exists with the standard parallel port on the Monochrome board. The internal cable, connector and hardware are all included.

ASYNCHRONOUS (RS232) COMMUNICATION ADAPTER.
Using the same chip as that on the IBM ASYNC board, the device is software programmable for baud rate, character, stop, and parity bits. A male DB25 connector located on the back connector is identical to that on the IBM Async. Adapter. The adapter is used for connecting modems, printers (many letter quality printers require RS232), and other serial devices. Switches allow the port to be configured as COM1 or COM2 and the board fully supports IBM Communications Software.

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Computrickx, Petaluma, CA

BBasic. Learn how to program your pc through a friendly and constantly interactive program. Requires color graphics adapter. $130.

ABasic. A complement to *BBasic* that includes advanced lessons on file management and string manipulations. Requires color/graphics adapter. $170.

The Keyboard. Learn the sophisticated functions of your pc keyboard through an amazing, illustrated program. Requires color/graphics adapter. $40.

Bridge Tutor. Designed for beginners and experts alike; gives immediate detailed feedback on your bid or play. It teaches you rules and strategy for social to tournament play, and generates practice hands randomly. Requires color/graphics adapter. $60.

Davidson & Associates, Rancho Palos Verdes, CA

The Speed Reader, by Janice G. Davidson, Ph.D., and Richard K. Eckert, Jr. A complete reading improvement program designed by reading specialists to increase speed and improve comprehension. Contains two disks, five separate exercises, and thirty-four reading selections with quizzes to check comprehension. $74.95.

Educational Data Services, Opelika, AL

Genie, by David B. Crouse. An open-ended, educational game for elementary school children. By creating pictures on the monitor, they will learn Basic programming, coordinate geometry, colors, and shapes. Graphics adapter required. $32.

IBM, Boca Raton, FL

Fact Track. Designed to help students master arithmetic. Requires Color/Graphics Adapter. $90.

Arithmetic Games, Sets 1 and 2. Develop and refine mathematic and logic skills. Requires Color/Graphics Adapter. $60 each.

Typing Tutor. Touch typing instruction and drill program that creates individualized drills that adjust to your skill level each time it is used. Requires 48K, 32K in cassette version. $25.

Individual Software, Redwood City, CA

The Instructor, by Jo-L Hendrickson and Diane Dietzler. A tutorial program that transforms the pc into an interactive, self-teaching tool for teaching new and first-time users the interactive aspects of their computer. $49.95.

International Computers, Mexico Beach, FL

GoForth. A Forth computer-assisted instruction course that teaches Forth. The Forth programming language and editor included. Try the restricted $5 version. $59.95.

NorFork Systems, Laurel Springs, NJ

Word-Score. Challenging hangman-type word game for one to four players. Four levels of vocabulary are provided. Fifth level enables educator or parent to preload specific lesson words. Available with color and sound. Requires color/graphics adapter. $29.95.

Professional Software Associates, Minneapolis, MN

Form. Basic program formatter and lister. Produces a very legible output for easy understanding and debugging of program code. A great way to teach Basic. Formatting includes indented for-next loops, offset remarks, offset line numbers, separate line for each program statement, and much more. $39.95.

Science Research Associates, Chicago, IL

Computer Discovery. An interactive computer literacy program for grades six through twelve. Teaches about the computer by using the computer. Students work with a computer robot to learn programming concepts. Color monitor and graphics card required. $160.

SimSoft, Marysville, MI

Typing/Tutor. Helps you to learn to type or to sharpen your current typing skills. $29.95.

Software Laboratories, Dublin, OH

Kid's Package. Includes addition, subtraction, *Comput-a-Sketch,* states and capitals, and dates in history. Color/graphics card required for *Comput-a-Sketch.* $20.

Spinnaker, Cambridge, MA

Snooper Troops I and II, by Tom Snyder. First two cases in a series of interactive mysteries. Helps children learn to take notes, draw maps, organize and classify information, and develop vocabulary and reasoning skills. $44.95 each.

Story Machine, by DesignWare. An educational toy that helps children learn to write sentences, paragraphs, and simple stories. Using a supplied list of words, including nouns, verbs, and other parts of speech, a child types a sentence and then watches as the sentence is animated on the screen. Helps children write correctly and provides familiarity with the computer keyboard. For ages five through nine. $34.95.

FaceMaker, by DesignWare. A computerized spinoff of the popular Mr. Potatohead where children create faces and watch them come to life. For ages four through twelve. $34.95.

Delta Drawing, by Computer Access Corporation. A precursor

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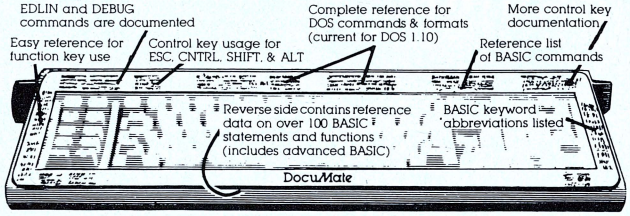

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to Logo's turtle graphics. It includes much of the power of turtle graphics but removes the difficult syntax. Children create colorful drawings on the screen using single-key commands to control the cursor. Changes are easy to make. Complex pictures, patterns, and designs can be built from simple parts because drawing programs can be nested inside another. Extensively play-tested in Boston area schools. For ages four through fourteen. $59.95.

A Christmas Sampler, by Dr. Mark Cross. A yuletide program that brings a variety of holiday classics to life with full-color graphics and sound. Interspersed with animation, the graphic depictions of *A Christmas Story, The Night Before Christmas,* and a selection of Christmas carols are accompanied by screen texts for easy follow-along by younger family members. Delightful Christmas music adds a festive dimension. Ideal for holiday gatherings at home or in the office. $29.95.

COMMUNICATIONS

Northern Red Oak

Alpha Software, Burlington, MA

The Apple-IBM Connection. Transfers *VisiCalc, WordStar,* and other files from Apple to the Personal Computer and back with no retyping and no errors. User can set up a network and control communication from any computer using master/slave mode. Also ideal for electronic mail. Comes with spoken instructions that serve as a hands-on tutorial. Requires communications board, connection equipment, Smartmodem, or acoustic coupler modem. $195.

Digital Marketing, Walnut Creek, CA

The Micro Link II, by Wordcraft. Conducts keyboard conversations, sends and receives electronic mail, and exchanges any text file (up to disk capacity). Saves all or selected parts of transmission to disk. Designed by and for the nontechnical user. Requires asynchronous communications card and IBM DOS. $89.

Electronic Data Systems, Richardson, TX

Communicator/Text Editor. Combines a full-capability communicator with a powerful text editor to form an intelligent work station. Communicates with virtually any mainframe, mini, or micro. Uploads/downloads and edits/creates text files and programs. Automatic dial up and logon to the Source, Dow Jones, Compuserve, GE, TSO, and VM/370. For the clerk, business, and computer professional. Requires eighty columns, serial interface, and modem. $99.

IBM, Boca Raton, FL

Asynchronous Communications Adapter. Card and software. 32K required. $40.

Dow Jones Reporter. Enables you to gather information from Dow Jones News/Retrieval Service. Requires modem and serial card. $100.

Inner Loop Software, Los Angeles, CA

VDTE (Video Display Terminal Emulator). Complete graphics terminal emulator and file transfer system. Emulates HP26xx and VT52-type terminals. Supports hi-res HP26xx vector graphics plotting sequences. All speeds 300 to 9,600 baud. Thirty-six page user's manual. Graphics requires Color/Graphics Adapter. $50.

Innovative Software, Overland Park, KS

Fast Com. Allows the pc to communicate over phone lines with other pcs, other computers, and information banks. Simplifies log-on procedures, displays the disk directory, or transmits files using a wild card feature. Can send incoming data to disk or printer. Requires RS-232 interface. $195.

International Software Alliance, Santa Barbara, CA

E/Lync and *Lync,* by Midnight Software allows communications with timesharing computers like the Source, and allows transferring of files (using automatic error detection and correction protocol) between pcs, or pc and CP/M or TRS-80 computers. *Lync* is for frequent users. It allows sending and receiving of files from timesharing computers and remote-control facilities when transferring files with other pc or CP/M system. Both require an RS-232 interface. *E/Lync,* $45; *Lync,* $125.

Max Software Publishing, Santa Clara, CA

Move-It. A communications program allowing local and remote directory listings, file transfers, message sending, and terminal emulation. $150.

Microcom, Norwood, MA

Micro/Terminal. Lets you access and exchange information with mainframe and minicomputers, with databases like the Source, Dow Jones, and Compuserve, and with other remote terminals or personal computers. Requires two drives and modem. $99.95.

Micro Control Systems, Vernon, CT

Space Communication. As part of the *Space Graphics* family of software, this permits bidirectional interactive sharing of graphics information. With it, you can transmit a 3-D drawing generated and stored in your computer through telephone lines to another user. Rotate, rescale, or move the image on your computer; your counterpart instantly sees the manipulation on his own screen. Interactive manipulation is also possible. Your counterpart can take control of the screen and manipulate the drawing as you watch if both users have the complete Space Tablet/*Space Graphics.* Requires 128K, paddle adapter, Color/Graphics Adapter, RS-232 interface, and modems. $500.

Norell Data Systems, Los Angeles, CA

Easytalk, by Harold Scott. An interactive communications program for timesharing and data transfer. Can send text and program files from one computer to another using protocols that synchronize the file transfer. Macro file capability eliminates the need for repetitive password procedures. Full bulletin board system with optional file compression transfer capability. Has autodial, redial, and autoanswer functions; support for the Hayes Smartmodem 1200 is built in. $79.95.

Office Software Automation, Richardson, TX

Interm/VT100. A high-performance, full-capability communication program that emulates the DEC terminal VT100, including cursor positioning and so forth. Allows the pc to be used as a terminal to DEC machines and the use of screen editors such as EDT and VT TECO. Also uploads and downloads files. Works at speeds up to 9,600 baud. Doesn't do double height and width. $495.

DowJones Toolkit. The *DowJones Toolkit* is a program that automatically interrogates the Dow Jones database for prices, news, and historical data. Instead of making assumptions about what you need to know, the data is arranged into *VisiCalc*-readable form allowing you to decide what you need to know. An extensive tutorial explains how to do some useful calculations, to compute the value of a portfolio, and to take advantage of *VisiCalc*'s ability to ask "what if?" $150.

Omric, Newington, CT

Genterm. A complete communications package that allows you to use your pc to communicate with most other micro, mini, and mainframe computers. Can be set up to conform to almost any communications protocol that involves character-by-character or line-by-line communication. Enables file transmission and reception. $89.95.

PBL, Wayzata, MN

The Personal Investor. A portfolio management, news terminal, and quotation system. This system can connect your computer with the Dow Jones News/Retrieval service to update the value of your portfolio, retrieve business news and information, and collect quotations. Free Dow Jones News/Retrieval password included with package. Requires 128K. $145.

Personal Systems Technology, Laguna Hills, CA

PC/Hasp. A multi-user remote job entry HASP work station emulator providing IBM host communications for the IBM Personal Computer. First in the Persyst family of mainframe-related software designed to enhance the pc in corporate data processing, *PC/Hasp* provides for concurrent support of up to seven multi-leaved input and output job streams. $995.

Professional Software Associates, Minneapolis, MN

Ice, by Kent Schroeder. Communication and terminal emulation program. Enables the pc to be used as a dumb terminal for mainframe time sharing applications (complete with line editor), as well as inter-computer communications and file transfer applications. Many other features included. $89.95.

Quest Research, Huntsville, AL

Questalk. An asynchronous communications package that permits connection with other computers or time sharing systems. Device characteristics are menu driven. File upload and download transfers to any external machine via a command protocol system. Written in assembly language and will support 300 to 1,200 baud communications. $45.

Smith Educational Engineering Services, Arlington Heights, IL

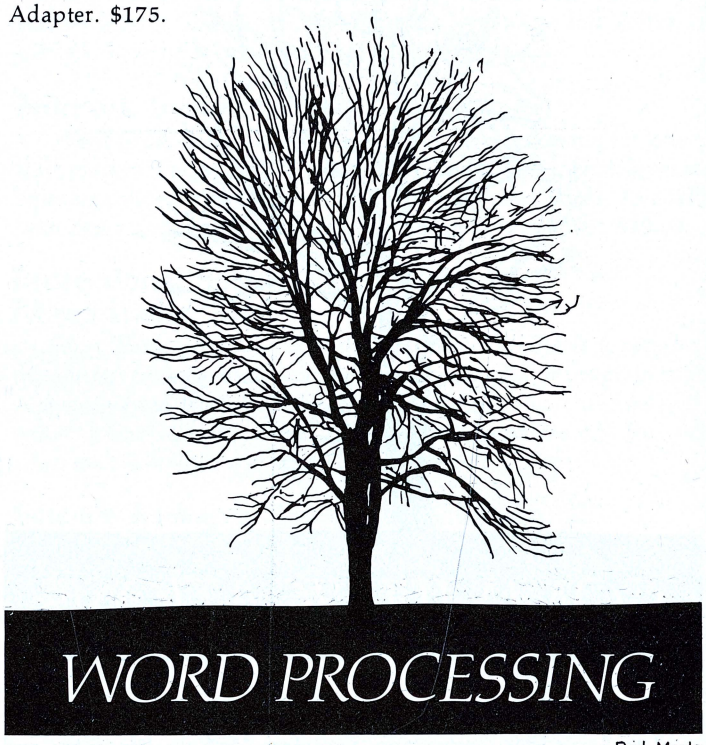
ICOMM, by Richard Pierce and Richard Smith. An intelligent communications package featuring operation to 9,600 baud, XON/XOFF handshaking, support of two communication adapters, disk file transfer, break key, programmable keys, selectable duplex, hexadecimal display mode, character editing, and printer copy. Supports the Hayes Stack Smartmodem. Requires asynchronous communications adapter and eighty-column display. $100.

The Source, McLean, VA

The Source. Dial up a wealth of information and entertainment, including UPI, electronic mail, stock information, airline schedules and travel reservations, games, electronic shopping—hundreds of services in all. Modem and communications card required. $100 fee, then charges from $20.75 to $5.75 per hour.

Starside Engineering, Rochester, NY

InterLync and *InterLync/APL,* by Mark S. Zachmann. Intelligent terminal programs that include data capture, *ETX/ACK* and *XModem* file transfer protocol, full-screen editing, user-definable function key strings, and on-line help. *InterLync/APL* provides true APL characters including legal overstrikes. Requires 128K, RS232C port. $100. *InterLync/APL* requires Color/Graphics Adapter. $175.



WORD PROCESSING

Red Maple

Beaman Porter, Harrison, NY

PowerText. An automatic word processing system that reduces typing to the equivalent of dictating. Stored format files determine style of professional-quality output. Automatic headers, footers, closings, cover pages, table of contents, and outline numbering. Supports RAM disk, serial printers, and external drives. $399.

PowerText for the UCSD p-System. An automatic word processing system that reduces typing to the equivalent of dictating. Stored format files determine style of professional-quality output. Automatic headers, footers, closings, cover pages, table of contents, and outline numbering. Supports RAM disk, serial printers, and external drives. Comprehensive ten-lesson tutorial. Requires UCSD-p system with editor and filer. $199.

Blue Water Systems, Oceanside, CA

Expandson. Lets you get the most from your Epson printer. Used with *WordStar* it allows you to easily create documents that use all of the Epson's features. You get expanded text for headers and titles, super and subscripts, italics and compressed print, line graphics and foreign character set, and more. $39.

Digital Marketing, Walnut Creek, CA

Footnote, by Pro-Tem Software. Automatically numbers and

formats footnote calls, footnotes, and text, placing footnotes on the bottom of the correct page. At the user's option, the footnotes can also be removed from the text file to a separate note file. Footnotes can be entered singly or in groups, in the middle or at the end of paragraphs. Price includes *Pair*, a companion program that checks that underline and boldface commands are properly terminated. Requires *WordStar*. $125.

Grammatik, by Aspen Software. Detects grammatic errors as well as other common mistakes that are not detected by most spelling checkers, such as doubled words, inconsistent capitalization, and incorrect punctuation. Also checks your documents for writing style, using a dictionary of over 500 misused phrases. Marks problems for easy correction with your word processor. $150.

Distributed Software Systems, Northbrook, IL

Quick-Text Word Processing System. User-oriented word processing system, designed with ease of use in mind. Makes extensive use of sound, function keys, ghost cursor, and screen highlighting. System will perform right justification, word wrap, centering, headers/footers, page numbering, text reformat, create/merge file, block/line move, copy, or delete, full scrolling, and spelling verification. $99.

Emerging Technology, Boulder, CO

Edix. A full-screen editor featuring up to four independent windows, twelve text buffers, regular expression pattern matching, inter and intra buffer block moves and copies, on-line help, and an on-line, interactive tutorial. It is very fast and very easy to use. Requires 128K, $195.

Wordix. A powerful text formatter featuring automatic footnote placement, automatic hyphenation, automatic table of contents generation, multicolumn layout, superscripts and subscripts, mailing list merging, user defined macros, and support for all printer types. In combination with *Edix*, *Wordix* is an exceptionally powerful and efficient word processor. Requires 128K. $195.

IBM, Boca Raton, FL

EasyWriter, Version 1.1. IUS's word processor. $175.

Image Processing Systems, Madison, WI

Proofwriter. A full-screen, menu-driven word processor, program editor, and spelling checker. Tabs, margins, and text reformatted on-screen automatically. Simple cut-and-paste and mail-merge capabilities. Spelling errors displayed in reverse video. Many printing options. Easy to learn. Requires 128K and two disk drives. $180.

Information Unlimited Software, Sausalito, CA

EasyWriter II, by the Basic Software Group. An easy-to-use word processor that employes function keys to change the editing mode, reducing most commands to single keystrokes. Automatically saves each individual page to disk. Requires two drives. $350.

Easy Speller II. A spelling checker compatible with *EasyWriter II.* It has an 88,000 word dictionary. Requires two drives. $125.

Intellect Associates, Holbrook, NY

PCtext. A text processing program that allows the user to generate formatted documents using any text editor. By embedding commands inside the rough text, the user can control spacing, justification, page numbering, indentation, headings and footings, and more. Easy to learn and use, it's ideal for large documents. $100; Demonstration version with manual, $25; manual alone, $10.

Lifetree Software, Monterey, CA

Volkswriter 1.2, by Camilo Wilson. A word processor specially designed for professional users of the pc. Elegantly combines power and simplicity to appeal to novice and expert alike. On-screen tutorials make learning quick and easy; advanced features (proportional spacing, micro justification) appeal to more stringent requirements. $195.

Max Software Publishing, Santa Clara, CA

The Word Plus. Locates and corrects misspelled words. Shows the words in context, hyphenates, and checks 10,000 words in less than two minutes. Includes a vocabulary of more than 45,000 words. $150.

MicroPro International, San Rafael, CA

WordStar. A screen-oriented word processing system featuring both initial entry of text and revisions displayed directly on the screen during typing. Also includes help menus, horizontal scrolling, and column move. $495.

SpellStar. A spelling checker that works with *WordStar* to find spelling and typing errors in word processed documents. Proofreads documents at thousands of words per minute with its 20,000-word dictionary-on-a-disk. Flags each word not in the dictionary with a flashing cursor. Requires 56K. $250.

MailMerge. A multipurpose file merging program that can accomplish complex word processing projects such as personalized form letters, invoices, mailing labels, and boilerplate legal documents. Permits the merging of data from two or more files at print time; chained and nested printing; printing multiple copies automatically; and printing data in report format. $250.

Norell Data Systems, Los Angeles, CA

Easytext Format Processor, by James Gillogly. Neatly formats a document by dividing it into pages with space at the top and bot-

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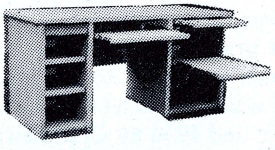

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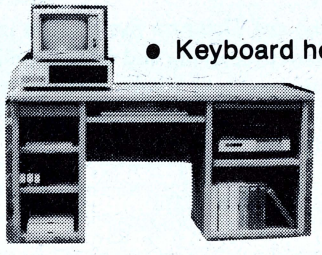

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tom, even margins, specified headings, and page numbers. It can create a table of contents, help create an index, and generate form letters. $79.95.

Easyedit Text Editor, by Ed Zrostlik. A two-dimensional cursor-based screen editor—the monitor screen is a window into a file and displays a portion of the file being edited. Uses function keys to perform simple operations that are immediately reflected in the file as displayed on the screen. $79.95.

Easyproof Spelling Checker, by Robert Wesson. A spelling error detection and marking program that is compatible with documents produced by most text editors and word processing systems. The program reads a document, presenting you with a list of the words it thinks are incorrect. For each word, you can decide whether to pass it, add it to the dictionary, or mark it as an error in the document. $79.95.

ProActive Systems, Palo Alto, CA

ProText. A high-performance text formatter for the NEC PC 8023A printer which can generate manuals and reports with multiple type styles, fonts, and print options. Special features help the user create tables of contents, lists, forms, and charts. Capable of merging several input files. Uses flexible command language and provides efficient operation. Embedded text commands produce a finished, formatted document on user's printer. $75.

Quest Research, Huntsville, AL

Printer. Professional-quality file printouts. Optional title page with two-inch file name, date, time, and file size. Menu-driven default options for page headers, page numbers, line numbers, lines per page, characters per line, tab, or no tab. Allows user to print selected lines. $45.

Frank Schiele Software, Chula Vista, CA

Super Editor. Powerful full-screen text editor. Block copy, move and delete. Cursor and scrolling controlled from keyboard. $55.

Systemics, West Bloomfield, MI

EZMemo+. Simple and easy-to-use, line-oriented word processing for novices and occasional users. Create, save, recall, edit, and print any single page document in any IBM 80 CPS matrix printer type style. Use with *EZLabel+* files to print personalized letters with custom letterheads. Requires two drives, monochrome display, and IBM 80 CPS matrix printer. $49.95.

TexaSoft, Dallas, TX

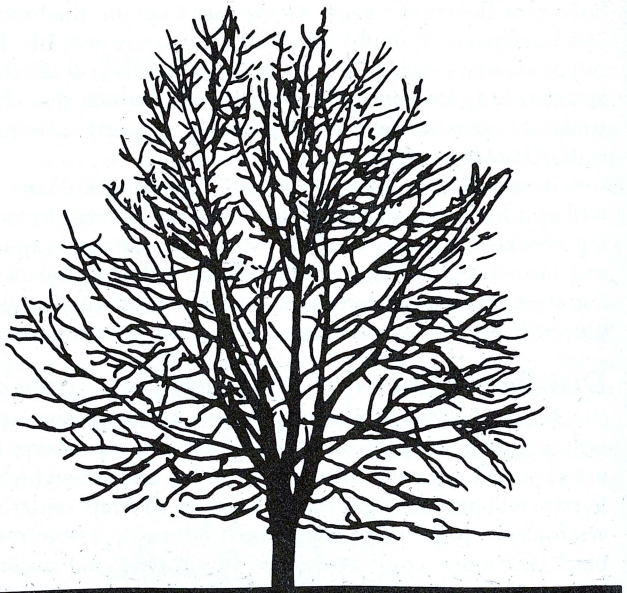
VersaText Word Processing and Database System. An integrated series of programs to meet word processing and database needs. The database supports mail merge, printing labels, sorting, and more. Screen editor has full cursor control, processor is a versatile text formatter. Requires two disk drives. $149.

International Software Alliance, Santa Barbara, CA

Proscript Text Formatter, by SoftCraft. Produces beautifully formatted output when combined with a text editor like *Edlin*, *Vedit*, or *P-mate*. Twenty-nine print directives include footing, heading, chapter, indent, justify, center, plus directives for Epson printers. Automatic section and paragraph numbering and table of contents generation makes it ideal for technical manuals. $75.

Office Software Automation, Richardson, TX

Runoff/PC. The Personal Computer version of a popular DEC document-generation program *Runoff*. Provides direct compatibility with DEC *Runoff*. Will drive the Epson and Diablo printers. On the latter, documents can be printed with full proportional spacing. $495.



BUSINESS

White Ash

Aardvark Software, Milwaukee, WI

Professional Tax Plan. Designed for the professional tax planner, here is a problem-solving tool that quickly determines accurate answers to various what-if tax situations. Touche Ross and Co., a prestigious international accounting firm, has reviewed and tested the program. Requires two disk drives. $350.

Estate Tax Plan. A problem-solving tool that allows the professional estate tax planner to evaluate various estate tax planning strategies. The program permits consideration of the factors affecting the gross estate, allowable deductions, and the disposition of the client's assets via trust arrangements or bequests. Calculates estate tax liability for up to four separate fact situations, simultaneously. Requires two disk drives. $550; enhanced version, $750.

ABW, Ann Arbor, MI

RL-1 Relational Database. A relational database management system that includes query language, program interface, relational editor, and utility programs. To assist the user, many application packages have been provided for use with the system. Requires 96K and two disk drives. $75.

RL-1 Input Processor. Allows the user to input data via custom-designed forms for easy operator entry. Requires *RL-1 DBMS*, 96K, and two disk drives. $75.

RL-1 Report Generator. Allows the user to predefine information layout for report-type output. Requires *RL-1 DBMS*, 96K, and two disk drives. $75.

Alpha Software, Burlington, MA

Type Faces. Powerful printing tool that greatly increases the utility of your dot matrix printer. Output can be reduced for letter-quality text. Fifteen different type styles and over one hundred symbols satisfy every printing need. Requires two drives. $125.

Data Base Manager. Helps you keep track of virtually any information, and keep that information up to date and accurate. You design how information goes in (up to 2,800 records with DOS 1.1), and how it is reported. Saves up to ten custom-designed report formats. Advanced features include phonetic search, flexible format mailing list, automatic use of printer's condensed mode, and more. Requires two disk drives. $245.

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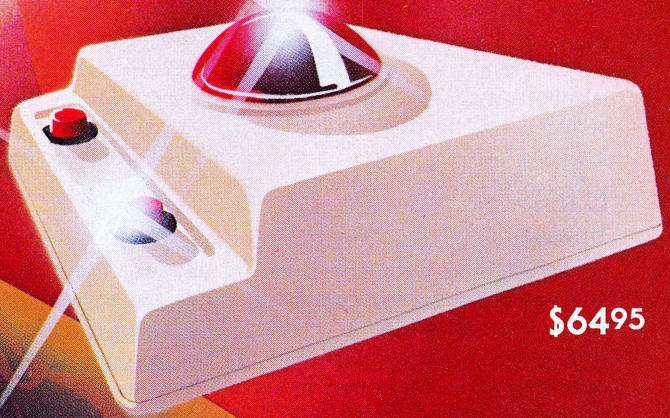

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TG Products, the oldest and largest manufacturer of accessories for personal computers, brings products to you that are designed to provide the ultimate in man-machine interface, and years of gaming fun.

SELECT-A-PORT extends the flexibility of the Apple's game port. It has three switch selectable sockets isolated by diodes to prevent interference, a socket which automatically modifies the Joystick, Paddles or Track Ball to operate as the second unit in dual unit games, and one socket with no isolation for highly sensitive devices.

JOYSTICK has completely linear operation, exclusive trim adjustments for both axes and a self-centering feature you will want to use for some games and disengage for others.

GAME PADDLES have large, easy to push buttons and extra long 60" cords which make them easier to handle and add to your game playing enjoyment.

TRACK BALL is a new omni-directional guidance system which adds excitement and quick response to games requiring a lot of movement commands. It has a lower control-to-movement ratio than the Joystick control which allows more sensitive positioning for graphics work on the screen. Fire control buttons are recessed below the ball control plane for unobstructed movement.

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Ashton-Tate, Culver City, CA

dBase II. This relational database management system is a powerful, easy-to-use tool for constructing and manipulating data files. Package includes systems disk, demo disk, and thorough documentation. Thirty-day money-back guarantee. Requires 96K. $700.

Broderbund, San Rafael, CA

General Ledger, by Hal Faulkner. Up to two thousand accounts, values up to ten billion dollars, user-definable report generator, unlimited journal entries, and much more. Requires two disk drives and printer. $495.

Payables, by Hal Faulkner. Handles 200 open accounts, 1,600 open invoices, and 1,000 checks per disk. Allows for debit and credit invoices; computes and tracks discounts, multiple debits per invoice, and cash flow reports by due date or discount date. Requires two disk drives and printer. $395.

Business Master, Carlsbad, CA

BusinessMaster Plus. General accounting package with fully formatted screens. Includes accounts receivable, accounts payable, inventory, payroll, fixed-asset accounting with ACRS, mailing list, and general ledger. Available for CBasic2/86 or IBM Basic. $289.

ColorCorp, Bloomfield Hills, MI

ColorBiz. An inventory program designed to take advantage of a color monitor. Requires two disk drives and 132-column printer. $498.

Data Consulting Group, Foster City, CA

EZRetail. Turns the pc into a cash register for retail sales, inventory, and commissions. This one really beats the old pencil and paper method. Credit card control, customer credit limits, tax receipts, and sales analysis are among the functions. Requires two drives. $245.

EZ Telephone. Keeps track of name, address, home, and work telephone numbers, a special date, and personal notes. Records can be listed in a directory and viewed on the screen as required. Retrieval is based on a one to five character key assigned by user. $25.

Datasmith Micro Software Systems, Shawnee Mission, KS

Bookkeeping System. Features include ledger and journal entry and update, automatic out-of-balance detection, and fast posting. Prints chart of accounts, journal listing, balance sheet, profit and loss, and comparisons between any two accounting periods. Accounts payable checks may be printed on system printer with journal entries made automatically. Full source code included. Requires two disk drives. $300.

Payroll System. Calculates federal, state, FICA, and local taxes plus earned-income credit. Has up to five recurring deductions per employee, plus five one-time pay amounts or deductions per period. Maintains loan balances and vacation time taken and due. Prints employee master list, payroll report, paychecks, and W-2 forms, plus several comparative reports needed to complete government quarterly reports. Full source code included. Requires two disk drives. $400.

Davell Custom Software, Cleveland, TN

Pairstat. A paired data statistics package including data entry and editing, polynomial regression to order 20, scatter and smooth curve plotting, integration, differentiation, interpolation, extrema calculations, user-defined functions, R square, standard deviation, plot of residuals, beta, standard error of the coefficients, and mean. Requires IBM or Epson printer with Graftrax. $150.

Digital Marketing, Walnut Creek, CA

Milestone, by Organic Software. Critical path network analysis program for scheduling manpower, dollars, and time to maximize productivity. Interactive project management program that can be used to track paper flow, build a computer, check a department's performance or build a bridge. $395.

Plan80, by Business Planning Systems, Inc. A financial modeling system that's easy to use and powerful enough to replace most timesharing applications. Lets you calculate IRR and depreciation as well as trig functions effortlessly. You write a model just the way you would write a letter using any editor or word-processing program; play what-if by inputting new values interactively. It also tackles any numerical problem that can be defined on a worksheet. Calculations are defined using real English, not matrix coordinates. $295.

Digital Systems, Hampton, NH

PhoneSaver. An easy to use database management system designed to report long-distance charges by number and department while also listing unauthorized calls. Client coding can also be used by professional offices to control reimbursable charge calls. Requires two disk drives. $95.

Distributed Software Systems, Northbrook, IL

PC-Order Entry System. High performance order entry system that utilizes menus and fill-in-the-blank screens. Customer and item information automatically looked up and displayed. System will print purchase orders (invoices) and daily sales analysis reports. Automatic calculation of taxes and discounts. $325.

Dynatech Microsoftware, Niles, IL

The IBM Codewriter. Easy, powerful business information control without programming. Complete stand-alone data entry, report, and interactive menu programs written automatically for the manager who needs custom software now, not programming hassles. Requires two drives. $395.

Eagle Software Publishing, Wayne, PA

Tax Decisions. Time-saving tool for the tax professional's desktop computer. Minimizing tax liability prior to the end of the tax year is the goal. Contains a software disk, step-by-step instructions, and warranty. All packaged in a convenient stand-up easel binder. $299.

Money Decisions Volume I, by Joseph A. Mascio. First in the Eagle "All Pro" series, a software package that puts thirty-four of the most frequently used business and financial problem solvers right on your desktop computer. Designed to assist the businessman in three broad categories: business management, loans, and investments. Contains extensive tutorial and help features. $199.

Ensign Software, Boise, ID

Church Membership. This full-featured database is designed to maintain any church's membership records where individuals are grouped by family. You can add families to the database, update any piece of information, retrieve family records by entering the family name, browse through the database, and print membership list, address labels, telephone directory, and class rosters. Requires eighty columns. $69.95.

Bowling League Statistics. Maintains all bowling league statistics and memberships, computes individual handicaps and team standings, and prints various reports. The ideal system for a league secretary. Earn money by using your pc and this software package to maintain league statistics for bowling leagues in your community. Requires eighty columns. $99.95.

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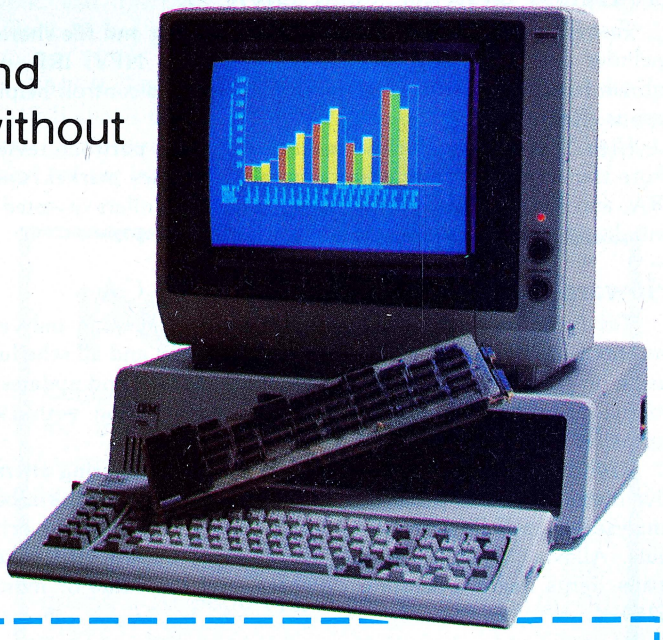

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GMS Systems, New York, NY

Power-Base. A relational database management system that is truly easy to use and offers full features such as screen painting data definitions, fast b-tree access capabilities, and flexible report generator. Built for serious applications development by non-programmers. CP/M version, $475; PC-DOS version, $395.

High Technology Software, Oklahoma City, OK

Gusher. Specially designed for oil and gas operators, this program figures joint interest statements and revenue distribution from production runs, writes checks (royalty disbursements and payables), generates well payout, A.F.E., 1099 reports, and more. Useful accounting information is readily accessible in a highly organized, condensed form. Requires UCSD p-System, two disk drives, and 132-column printer. $995.

P.A.C.E. (Prompt, Accurate Cost Estimator). A flexible package that aids an estimator in almost any industry in appraising the cost of equipment, labor, materials, taxes, union dues, and all other project costs. Saves estimating time and work while producing more accurate estimates. It will even notify the user of outdated costs. Requires UCSD p-System, two disk drives, and 132-column printer. $395.

Hourglass Systems, Glen Ellyn, IL

Fast Figure. Spreadsheet with flexible printing and file sharing. Includes full math, trig, business depreciation, NPV, IRR, and growth functions. Features cell level operation and control; helping menus. Requires 128K.

High Yield. A mutual fund manager featuring portfolio review. Store transaction data including mutual and money market funds, IRA, and Keogh plans. Get summary totals for dollars invested or withdrawn, plus rates of return. Requires 128K. $75.

Howard Software Services, La Jolla, CA

Tax Preparer. A package for year-long record keeping and year-end tax filing. Prepares returns for several forms and all schedules using on-screen facsimiles. Performs all calculations and updates all forms; prints in IRS format for filing. 1983 edition with 1982 forms. $250.

Real Estate Analyzer. A tool for objectively comparing alternative investments and projecting future results. Professional in both analyses of cash flow and R-O-I and client-oriented report printouts. Allows "what if" studies for changes in property values, loans, rents, taxes, operating expenses, and the value of money. $250.

IBM, Boca Raton, FL

Peachtree Accounting System. General ledger, accounts receivable, accounts payable, inventory control, and payroll. Two drives, printer required. $595 each.

BPI Accounting System. General accounting, accounts receivable, inventory control, payroll, and job cost. Two drives required. $425 each, except job cost, which is $550.

VisiCalc. The original spreadsheet program. $200.

Time Manager. Microsoft's scheduling program and electronic calender. $100.

Info-Pros, Irvine, CA

Info-Reporter. A high-performance program used to create, replace, or delete reports associated with a data file. Reports are easily designed by the user on the screen. It can output selectively to a parallel or serial printer, asynchronous communications port, or screen. Designed for the first-time user. Requires eighty-column display and two disk drives. $195.

Info-Gen. A fast-access, easy-to-use, multi-key record management system designed for the first-time computer user. Assists the user in defining a master data file and designing its data entry screen. The record maintenance, standard report, menu, and utility programs are then automatically generated. Requires eighty-column display and two disk drives. $295.

InnoSys, Berkeley, CA

Money Maestro. A financial record-keeping package that provides budget tracking and tax reporting. Sole proprietors, professionals, and families can now realize the benefits of automated money management without investing in double-entry accounting software. Expenses and receipts can be tracked as needed by simple commands to the category and payee lists. $200.

Innovative Software, Overland Park, KS

T.I.M. III (Total Information Management). A full-featured database manager that allows pc users to organize large amounts of information for quick retrieval, sorting, and printing. Each record can have as many as 2,400 characters, and data files can even be sent to a word processor or *VisiCalc*. Requires 64K, two disk drives. $495.

Fast Facts. A personal file manager that's easy to learn yet flexible enough for both home and office use. Files can be searched and sorted then printed on mailing labels or any other report format. Plus, data can be sent to *VisiCalc* or graphics files. Requires 96K and two disk drives. $195.

Insoft, Portland, OR

Data Design, by Softrix. A relational database management system. Each user views data through forms that are created on screen. Each data table may have up to twenty-six forms. Excellent documentation. Requires 128K. $225.

The Accountant. Organized into four packages, *The Accountant* is fully menu-driven and includes general ledger, accounts receivable, accounts payable, and payroll. Using commercially available forms, it is designed for easy startup and includes comprehensive training manuals and sample data files for practice prior to actual installation. All four modules, $365.

International Computers, Mexico Beach, FL

Mr. Scheduler. An appointment and scheduling system suitable for doctors, dentists, lawyers, or salesmen. 1,000/2,000 appointments on single/double-sided disk. Access any entry by appointment date or time, or client name, in less than one second. $79.95.

Mr. Mailer. Would you believe printing 50,000 labels without changing floppy disks? If you make bulk mailings, this is the program for you. Input of 500 addresses/hour and output of 9,000 labels/hour (printer dependent). Requires printer and two disk drives. Try the restricted $5 version. $495.95.

International Software Alliance, Santa Barbara, CA

Inventory with Cash Register. Designed for retail operation with a maximum of one thousand items. Tracks ordered items, prints reorder reports, usage reports, inventory lists, and sales tax reports. Cash register updates inventory, generates invoice, and prints daily transactions register. $125.

General Ledger with Graphics, by DataCount. Field proven on many IBM 5110s, it's easy enough for a first-time user, yet powerful enough for CPA client write-up work. Balanced entries only, good audit trails, and standard reports and statements plus graphs. $295.

International Software Marketing, Syracuse, NY

MatheMagic. A unique and easy-to-use software product that

allows anyone to solve the simplest calculations to the most elaborate mathematical formulas without programming. Mastered in minutes, it has a broad capability to do mathematic applications for business, science, engineering, education, and in the home. Compiled Basic version requires 96K. $129.95.

Joseki Computer, Redondo Beach, CA

Project Management Tool. Designed for nontechnical managers, project leaders, and other individuals who need planning and project tracking support. The user enters a project as a series of things to do, giving the system an estimated time for each thing to do, and a responsible person. The system will use the critical path method to calculate the total amount of time the project should take, and which things to do are the most critical from a timing standpoint. $99.95.

Time and Expenses Billing System. Designed for the individual consultant, professional, or business person who charges for services on an hourly basis. *TEBS* is designed to keep a record of time billing and expenses by client, allow additions at any time, calculate daily billable time, allow premium or minimum time charges for individual clients.

Max Software Publishing, Santa Clara, CA

Quic-N-Easi. A business applications development system for the novice or professional programmer. Saves hours of coding; includes screen builder, editor, and print routine. $195.

McMullen & McMullen, Jefferson Valley, NY

Using VisiCalc. Composed of a disk of *VisiCalc* templates and two audio cassettes, this product is utilized interactively by the new *VisiCalc* user to develop a thorough understanding of this powerful spreadsheet program. Based on the successful hands-on course provided by McMullen & McMullen to Fortune 500 companies. $64.95.

Using 1-2-3 (The Beginning). Composed of a disk containing a *1-2-3* database and two audio cassettes, this provides the purchaser with a working knowledge of the dynamic new product from Lotus Development that promises to be the major decision support system for the pc. $79.95.

Micro Architect, Arlington, MA

IDM-I1. A database manager. Requires monochrome display and 132-column printer. $198.

IDM-X. An advanced version of *IDM-I1.* Requires two drives, monochrome display, and 132-column printer. $395.

Mail-X. A mailing list program. Requires two drives, monochrome display, and 132-column printer. $198. With report writer and utilities, $298.

Micro Control System, Vernon, CT

Slide Pro. Designed to permit interactive generation of charts suitable for use in making overhead projection slides. Entirely menu driven and uses the function keys as its primary input medium. Prestored shapes, including arrows, boxes, diamonds, and circles are used to create charts. The size and location of each shape can be interactively controlled by positioning two keyboard-controlled cursors. Text and color are also controlled interactively. Different colors produce shadings on the hard copy. Choose from two color pallettes. The black and white charts produced on plain paper may then be used to generate overhead projection slides on a copier or Thermofax machine. Slide files may be stored on disk for future use or modification. Requires color/graphics monitor adapter and printer with Graphtrax. $95.

Micro Decision Systems, Pittsburgh, PA

DocuCalc. Displays and prints *VisiCalc* models, showing equations in full, in correct sequence and layout. Reports on all advanced *VisiCalc* key sequences, attributes, formats, and print specifications. For documentation of models and presentation to model users. $95.

Norell Data Systems, Los Angeles, CA

Easydata Information Processor, by Orville Stoll and Melvin L. Norell. A series of processing programs that allow you to create a database of information. Data is entered, changed, updated, deleted, displayed, and printed with minimal amount of effort and without your having to continuously swap disks. Unique data management structures eliminate the need to sort databases at the time of report generation or data extraction. Consists of over eighteen modules including screen painter, data entry, database creation, database manager, report formatter, report generator, label processor, and other utilities. Requires two disk drives. $250.

Easycalc Spreadsheet Calculator, by Robert Wesson. A simple, easy-to-use calculating tool that can be used to compute budget, record and project your investment returns, even do your taxes. $99.95.

North America Mica, San Diego, CA

PMS-II. A critical path project management system that is mainframe competitive and produces Gantt charts, activity diagram, funding schedule and graph, and extensive activity reports. Tracks budget and actual dollars, work on three through seven day work week, and interfaces to your job-costing system. CP/M-86 and CBasic-86 are required, as well as at least one megabyte of disk storage. $1,295.

RMS-II. This resource management system add-on module to PMS-II allows the definition and allocation of up to ninety-six separate resource centers with extensive tabular and graphics reporting. Ideal for the matrix-type organization. $995.

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Options-80, Concord, MA

Options-80, by Patrick N. and Timothy J. Everett. Option investing program guides user to transactions that will maximize return on investment for expected share movement. $125.

Prodata, Boise, ID

Check Book Plus. A sophisticated check register, reconciliation, and expense/revenue reporting system. Primarily designed for business use; can be used for home owners who want the most in checkbook record keeping. $99.95.

Personal Systems Technology, Laguna Hills, CA

Wait-Less Printing. An inexpensive yet efficient print spooler for the IBM Personal Computer. Designed to use a portion of main-memory as the spool buffer, it does not require additional hardware. $49.95.

Jobtrax. A planning and monitoring tool for engineering, architectural, and construction projects. You can plan manpower and resource requirements, and monitor project budget and schedule status with easy-to-read graphical reports and important project information. Critical path method scheduling. Built-in screen editor. Requires 128K and Color/Graphics Adapter. $285.

Professional Software Associates, Minneapolis, MN

Super Mail. Mail list manager that features unique aged mailing (times printed with date of last printing) and state abbreviation help screen. Selective search (one or all fields); batch update of records. Print multiple labels on any size label. Multifield sort. Access less than two seconds with full data disk. $49.95.

Quala, San Fernando, CA

Taskmaster. An easy-to-use way to organize yourself, your department, or your company. Allows the scheduling of tasks by starting and completion dates, department, person, project, and subproject. Produces reports and Gantt charts on the screen or on a printer. Keeps track of man-hours and percentage completion. This is a practical management tool developed and used in a medium-size company. Easy to learn. Requires eighty columns. $129.95.

Quest Research, Huntsville, AL

FormWriter. Innovative software makes filling out forms a breeze. Specify all the details one time and let *FormWriter* prompt you for all the information needed to fill out the form from then on. Supports "what if" feature, and interfaces to *VisiCalc* file formats. $150.

Sapana Micro Software, Pittsburg, KS

Sapana-Mail-Track-II. A mailing program that stores 1,100 records on single-sided (2,200 on double-sided) disk. May be searched and sorted across nine data items including phone numbers. Prints one to four across, warns for duplicate entries, and can handle foreign addresses. Requires eighty columns and a printer. $29.95.

Sapana-Expense Track-A. A program to keep track of expenses throughout the year; print useful reports at any time for home/small businesses. Fields for data entry include date, description, category one through ninety-nine, method of payment, code for payment, tax status, and amount. 2,496 expenses on a single-sided disk. Requires eighty columns and a printer. $29.95.

Simple Soft, Elk Grove, IL

QuikCalc Real Estate Investor. Provides sophisticated financial analysis of individual residence or income property sales and purchases. Provides loan amortization schedule, expense schedules, cash flows, tax benefits, and internal rate of return. Financing functions feature conventional mortgages, balloon payments, variable rate mortgages, and an interest-only loan. $129.95.

SimSoft, Marysville, MI

Mailing Label System. Includes phone numbers and messages. Prints labels and three-by-five cards. $29.95.

Accelerated Cost Recovery System. Prints depreciation schedules using the new ACRS and older methods. $29.95.

Diskette Management System. Keeps track of all diskettes by description, location, date created, and scratch date.

Smiser and Associates, Truckee, CA

Job Estimator and Specification Writer. Designed for the construction industry, the *Estimator* compiles itemized bids by item and category. A report is then generated with a summary by category, and corresponding list of specifications. $450.

Job Accounter. Designed to operate with the *Job Estimator,* here is a daily expense journal that maintains allocation of funds and existing balances for each item of the estimate, and forecasts actual job cost based on expenditures to date. $200.

A/C System. Includes daily journals, general and subsidiary ledgers, and primary financial statements. Expandable with other stock accounting programs or custom reports. $200.

Softrend, Charlottesville, VA

The 25th Hour: 25:01—Time Scheduler/Organizer. A comprehensive time management system that organizes any type of timed and untimed activity for any number of individuals or projects. Requires printer and eighty columns. $99.

The 25th Hour: 25:02—Magazine/Book Reference. An article abstracting system that organizes references to important information in all types of published material including books, magazines, journals, proceedings, newspapers, and so forth. Requires printer and eighty columns. $89.

Software 1040, New Hyde Park, NY

Plan 1040. The what-if tax planner that covers tax years 1982 and 1983 including the Tax Equity and Fiscal Responsibility Act of 1982. Any tax strategy can be reviewed within seconds. $150.

Software Dimensions, Citrus Heights, CA

Accounting Plus. This may well be the most comprehensive yet easy-to-use accounting system available. Designed to provide small to medium sized businesses with the information necessary to make sound decisions. Includes general ledger, accounts payable, accounts receivable, inventory, sales order, purchase order, payroll, and point of sale (for retailers). Requires a Xedex Baby Blue printed circuit board and a hard disk. Price varies.

Software Laboratories, Dublin, OH

File Clerk. Database manager, limited only by the amount of storage capacity on your disks. Up to 625 fields per record, with up to twenty-four characters each. The overall limitation for any record is 1,250 characters. Fifteen-digit numeric accuracy. User-defined format for data files and indexing. Search, select, and sort lists. Flexible, user-defined print-out generator. Includes manual and sample data. Requires eighty columns, parallel printer (eighty or 132 columns). $50.

General Ledger. A complete bookkeeping system. Timely, accurate, and detailed information about income, expenses, and balance sheet. Maintains a complete record of all entries in a chart of ac-

counts for up to 400 accounts. Provides monthly, year-to-date, and previous-year income statements for entire company or departments within a company. Prepares and prints out complete balance sheet, both current and previous year. Interfaces with *Payroll, Accounts Receivable,* and *Accounts Payable* programs. Eighty columns. $100.

Software Options, New York, NY

COTS (Commodity Option Trading System). An option valuation system for commodity professionals. All the information you need to trade options on physicals and futures, presented in clear color graphs and tables. $1,095.

DataWriter. A unique approach to database management that has drawn raves from users and reviewers. Use it for order tracking, client billing, expense record keeping, operational reporting with totals and subtotals, form letter production to a large list or subset, mailing list maintenance, and other business and personal applications. $225.

Software Training Company, Santa Monica, CA

D.B. Power for dBase II. Interactive training disk teaches you how to use *dBase II.* The computer teaches how to create a database, enter data, sort data, add, modify, change, and edit important data to generate comprehensive reports. Even develop mailing lists in less than one hour. Troubleshooting guide on how to fix simple problems. $75.

Plan Power for VisiCalc. Interactive training disk teaches you how to use *VisiCalc.* You'll quickly learn to create, modify, manipulate, save, retrieve, label, and print all the financial planning data you need. You'll be amazed at how simply you are able to arrange and calculate complex mathematical data. $75.

SoftWhere!, Thousand Oaks, CA

Suite 16 Manager. Allows menu-driven operation of DOS, and the user can also easily create custom menus. It's the ideal office automation program since users don't need to memorize program names. Just pick what you want to do from a plain English menu. $75.

Sorcim, Santa Clara, CA

SuperCalc. This popular electronic spreadsheet makes financial analysis, planning, budgeting, and "what if" calculations a snap. *SuperCalc* can take advantage of up to 512K of memory and will run in color. $295.

S.S.R., Rochester, NY

Infotory. A simple but comprehensive inventory management system that handles five thousand inventory items. Its unique data management feature offers flexibility in creating custom reports. Sales and cost analysis are provided by categories (product groups, departments, and so forth) designated by the user. Also available for hard disk drives. Requires two dual-density disk drives. $425.

Star Computer Systems, Torrance, CA

Star System 5 Legal Timekeeping and Billing System. An automated legal time-keeping and billing system for professional practices seeking improved flexibility, accuracy, turnaround time, and data accessibility. Requires 56K. $95.

Statistical Computing Consultants, Burke, VA

Survtab. For survey statisticians and market researchers, an easy-to-use system for entering, editing, and tabulating data from questionnaires. Produces frequency tabulations, cross-tabs, and banner tables. Includes forty-three-page manual with examples. Two drives recommended. $180.

Synergistic, Renton, WA

IBM Data Reporter, by John Conley and David Dickens. The most efficient, powerful database on the market for the IBM pc. The modified program generator creates a database that includes fast data entry and update, calculation abilities, machine language sorts and searches, a label-making utility, and much more. $250.

The Report Writer, by Michael Branham. General-purpose sophisticated text editor created to enhance the printing capabilities of the *Data Reporter.* Design, edit, and print form letters, legal documents, sales reports and so forth with data from your database embedded anywhere in the text. $100.

Systemics, West Bloomfield, MI

EZLabel+. Mailing labels and phone lists in a very easy-to-use program. Stores one thousand addresses per disk, sorts by zip code, last name, company name, and by user-defined codes. Use with *EZMemo+* to print personalized letters. Quick data entry, edit, and delete. Perfect for beginners. Requires two drives and monochrome display. $49.95.

EZCheck. Simple, easy-to-use checkbook and cash management. Enter checks, deposits, autoteller transactions. Define up to one hundred categories and reconcile statements. Print reports by category by month, or year-to-date. Identify taxable items and print checks with standard forms. Requires two drives, monochrome display, and IBM 80 CPS matrix printer. $49.95.

TCS Software, Houston, TX

TCS Total Accounting System. A fully integrated database management financial accounting system. Includes ledger, receivables, payable, payroll, and inventory. Each module comes with several utility programs. Requires two disk drives. Price varies.

TCS Client Ledger System. A sophisticated general ledger de-

TecMa, Santa Clara, CA

Phone Chronicle PC-IV. A hardware/software product that logs telephone activity, both incoming and outgoing. It logs call duration, number called, date and time, caller identification, and number of calls unanswered. Requires RS-232 port. $995.

TexaSoft, Dallas, TX

The Thinker Electronic Spreadsheet. An easy-to-learn spreadsheet program that allows you to answer those important what-if questions quickly. $49.

Ticom, Marina del Rey, CA

Final Copy. An integrated office information management software package. It combines word processing, forms and record processing, data management, and remote communications. Comes with a run-time version of the UCSD p-System. Requires two drives. $885.

TMQ Software, Buffalo Grove, IL

File-Fax. A database management system that offers quick access to files and records, retrieving information at exceptionally high speeds. It has a unique, powerful report generator. Designed especially for those new to computing—it's easy to learn and simple to use. It will satisfy the advanced operator as well. $175.

signed specifically for public accountants and those who provide accounting services to small businesses. Special features include the accelerated cost recovery (ACRS) depreciation schedule, passive payroll, ledger consolidation, and more than fifty clients. Requires two disk drives. Price varies.

VisiCorp, San Jose, CA

VisiFile. Organize, maintain, and more effectively use your business information. File name and address lists, prospect and customer files, personnel records, parts lists, merchandise inventories—almost anything. $300.

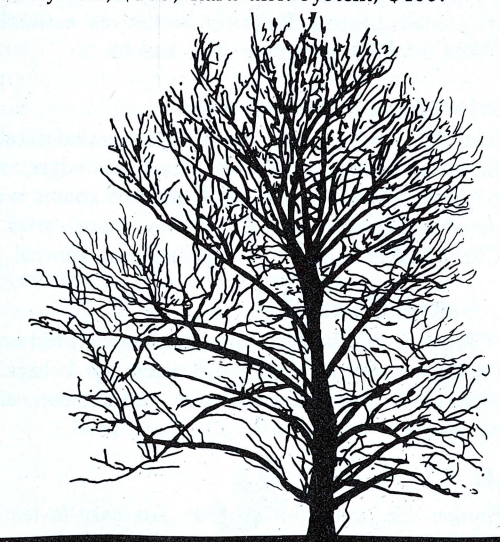
VisiSchedule. This powerful project planner makes it easy to control projects. It instantly shows skill levels, costs, and the critical path among your project's tasks. It allocates costs, specifies earliest and latest start dates, slack times, holidays, prerequisites, and deadlines for each task. $300.

VisiCalc. This powerful electronic worksheet helps solve number problems. Explore alternatives by asking "What If?" Just change any number in your problem and the new results are instantly calculated. $250.

VisiCalc Business Forecasting Model. Seven interrelated templates provide you with the financial information most vital to your business. $100.

World Wide Software Publishers, Berkeley, CA

Inventory Control. Allows the user to track up to 32,000 inventory items. The system tracks year-to-date sales and provides automatic ordering. Three versions are available with a conversion program for floppy to hard disk upgrades. Demonstration disk, $10; floppy disk system, $300; hard disk system, $400.



PROGRAMMING UTILITIES

Sweet Gum

Bit Software, Milpitas, CA

The Forms Designer. A flexible tool designed to save programmers and system analysts valuable time when producing application software that requires formatted screen display and data entry validation. Requires 128K and two drives. $275.

Blaise Computing, San Francisco, CA

Pascal Application Development Tools (Tools). Provides the extensions to IBM Pascal that allow the rapid development of user-oriented software systems. *Tools* is implemented as five integrated Pascal units: basic intrinsics, string functions, screen handling, graphics, and application routines. Comes with comprehensive documentation, examples, and all source code. Same requirements as IBM Pascal compiler. $125.

The Carter L. Cole Company, Woodland Hills, CA

Custom/Database. Maintains an integrated database and generates RM/Cobol source code for I/O requirements for environment and data divisions. Friendly screens make generation of error-free Cobol easy. $495.

Custom Report. Generates complete error-free RM/Cobol source code for report programs using an integrated database dictionary. Can be used to write reports and report changes not found in packaged RM/Cobol applications, using the actual data files without change or copying actual data files. $495.

Computer Control Systems, Largo, FL

FABS/PC. A subroutine that provides rapid access to very large data files. Key sequential, multipath, and balanced tree structure. Six key files can be open simultaneously; key file independent of data file.

Autosort/86M. A high-speed sort/merge/select module called as subroutine from IBM Basic, Basic Compiler, or Pascal. Very fast for large files. Sorts/selects on string, integer, and single precision/double precision fields. Sorts on ten keys, independently, ascending, or descending. $150.

CompuView Products, Ann Arbor, MI

VEdit. A full-screen editor. $195.

Conversions To Go, Carlsbad, CA

Disk Format Conversion for the IBM Personal Computer. Converts to or from many formats including PC-DOS, CP/M-86, Compuview CP/M-86 (eight inch), Apple, Superbrain, Kaypro II, Osborne I, NEC Televideo, DEC, Xerox 820, Heath Zenith 89. $20 per disk.

Data Consulting Group, Foster City, CA

EZ ScreenAid. This is a screen generator that allows a programmer to be more productive. Simply key in the fields and titles where you want them and coding is generated and saved on disk automatically. Hard copy shows the screen design and input specifications. $45.

EZ Utilities. Display, edit, or list your file without programming. These menu-driven utilities are very easy to use and can save you a lot of time and effort. A dozen other useful functions are included in the price. $75.

Digital Marketing, Walnut Creek, CA

Active Trace, by The Data Works. For the MBasic programmer, this program provides run-time information about the program as it runs. When a variable is encountered in the program flow, its name, line number, and current value are displayed to terminal or printer. Provides complete cross-reference facilities. $125.

Digital Research, Pacific Grove, CA

Concurrent CP/M-86. Single-user, multitasking operating system. Increases user productivity and hardware efficiency by utilizing the time that single-user operating systems lose to I/O-bound processes. Requires 256 Kilobytes of RAM memory. Single density disk and documentation, $350; documentation only, $50.

CP/M-86. A general-purpose operating system designed for sixteen-bit microcomputers. Features include dynamic file manage-

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You'll also appreciate **WRITE-ON's** capability as a powerful program editor. Nothing near its price edits BASIC, PASCAL, FORTRAN, COBOL, and Assembly Language source code so well. You can even use it to edit VISICALC and accounting system files.

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ment, fast assembler, general purpose editor, and advanced debugger. Compatible with CP/M and tailored to take advantage of increased address space. Single density disks and documentation, $250; documentation only, $40.

Distributed Software Systems, Northbrook, IL

XF-Dump File Utility. Machine language full-screen utility allows for the display, alter (edit), print, and search of any file or absolute sector. Hex and character formats supported for all functions. All file types can be accessed (system, hidden, and so forth), and altered. Delete, rename, and list directory functions included for ease of use. $70.

FSEditor Full Screen Text Editor. Full screen text editor for the creation and editing of any sequential file. All editing is done on the screen and changes are immediately saved to a work file. Editor supports block and line move, copy, or delete; text insertion, repeat line, append file, and print. Full or partial (up, down, left, right) screen scrolling. Delete, rename, and list directory functions included. $125.

Ensign Software, Boise, ID

Character Generator. Define the shapes of the graphic character cells for the ASCII codes from 128 through 255. The work tablet consists of three rows of eight enlarged cells per row. This multicell grouping makes it easy to design larger shapes. Features cell rotation, left-right flip, reverse video, scrolling, cursor movement, disk storage of character set definitions, more. 64K for Basic, 96K for compiled version, color/graphics adapter, eighty column monitor. $24.95.

ISAM Database. ISAM (Indexed Sequential Access Method) provides keyed access to data files for reading, writing, updating, and deleting records within the file. *Get* and *put* records to disk files by key in under two seconds. Browse forward and backward in key sequence. Update any part of the record, including the key. Automatic recovery of disk space occupied by deleted records. $69.95.

IBM, Boca Raton, FL

Basic Compiler. Two drives recommended. $300.
Fortran Compiler. Requires two drives and 128K. $350.
Macro Assembler. Requires 96K. $100.
Pascal Compiler. Requires two drives and 128K. $300.
Cobol Compiler. Requires two drives. $700.
DOS 1.1. $40.
CP/M-86. $240.
UCSD p-System. With Pascal or Fortran. $625.

Info-Pros, Irvine, CA

Info-Sort. A fast, high-performance sort, designed to be used as a stand-alone utility or to be interfaced with existing application programs. Typical time to read and sort 1,000 records and create an index file is less than ten seconds. Requires eighty-column display. $145.

Intellect Associates, Holbrook, NY

DMS. A data management system designed for the novice computer user. It allows the user to define a form on the screen and then to build, maintain, and access a database using this form. Easy to use and fast. Data files may be easily processed by programs written in Basic or Pascal. $150.

Window. A full-screen text editor that uses all of the screen and keyboard capabilities of the pc. It is extremely fast and very easy to learn and use. It features scrolling in four directions, text moving, marking, insertion, deletion, and more. It can edit any normal ASCII file and can edit files larger than memory. $150.

International Computers, Mexico Beach, FL

Mr. Spooler. Stop waiting for your printer to finish printing. Spooling to parallel and serial printers is possible. *List, Lprint,* and *PrtSc* work with your serial printer properly. *Xon/Xoff, ETX/ACK,* and hardware serial printer handshaking supported. $59.95.

Mr. Buffer. State-of-the-art software for the user concerned with disk access performance. Add life to your disk drive and floppy disks. Eliminate the drawbacks of using DOS such as slow data access, forced reading, and rereading of often-used portions of the disk. $199.95.

International Software Alliance, Santa Barbara, CA

Btrieve Record Manager, by ProScript. A powerful record management system for applications programmers. Builds files based on B-tree structure for fast random or sequential access to data. *Btrieve* is a memory-resident 10K assembly language program with Basic and Pascal utilities. $295; manual and demo, $30.

Joseki Computer, Redondo Beach, CA

Pick'n'Pack. Contains two utility programs for the IBM Basic programmer. *Pick-a-Menu* writes Basic code that will display a menu, collect and check menu command choices, and branch to the proper line numbers that execute menu choices. Parameters for writing menus can be saved for later editing or additions. $29.95.

Max Software Publishing, Santa Clara, CA

PC-Menu. IBM DOS performs easier by using cursor controls to rename, erase, run, or sort DOS files. $100.

Micromatch, Tujunga, CA

Assembly Utility Package. Included in the package are three keyboard handlers, two display handlers, two printer handlers (one with spooling), tone generator, DMA controller, timer controller, and interrupt controller. All source code is provided. Written in assembly language. Complete manual included. Requires macro assembler. $95.

Norell Data Systems, Los Angeles, CA

System-Spooler, by Dian Girard. A disk-based spooling system that implements a true foreground and background environment. Unlike other RAM-based printer spoolers that strictly buffer data while driving the printer concurrent with other operations, *System-Spooler* implements the concept of a print queue, that the user may interrogate to perform numerous functions. Spooled files may be held for special forms or for printing later. Requires 128K. $49.95.

Autodoc Basic Utilities, by Paul Desjardins. Complements the use of application programs developed using the Basic interpreter. A cross-reference utility is supplied that prints all the variables used in a program and the line number locations where each is found. A Basic program can be optimized by changing variable names to shorter forms and altering the location of variable definition. Several optimization and performance measurement functions are provided to improve processing speed. $49.95.

Peter Norton, Venice, CA

The Norton Utilities, by Peter Norton. A complete set of over a dozen power-tool utilities to enhance the PC-DOS operating system. The set includes a complete disk displayer, a file recovery utility, an easy disk-modification utility, a program to control

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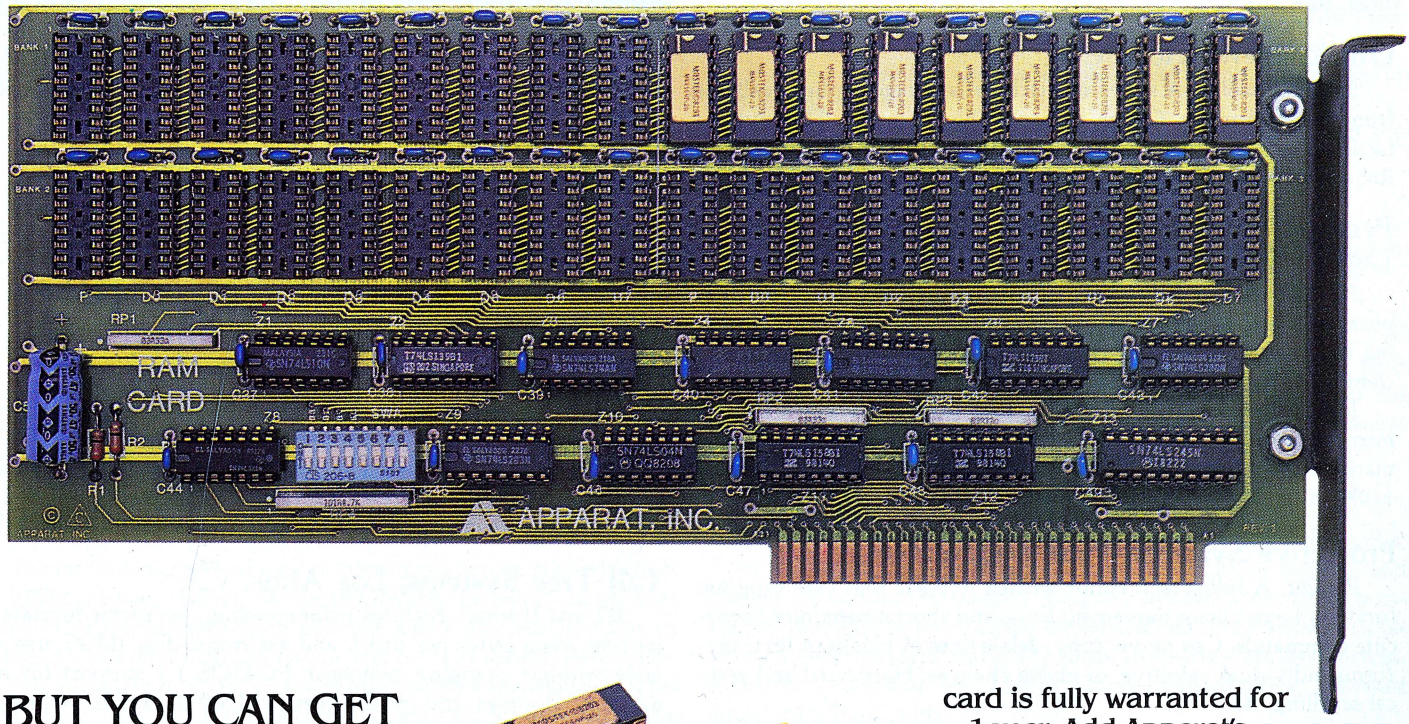

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hidden files, and a program that tests for damaged and protected disks, plus ten more utilities. $80.

Office Software Automation, Richardson, TX

PCM/1. A general-purpose macro generator, its uses range from program development to the automatic compilation of certain kinds of documents. $200.

Edcon. A full-screen editor that can be used to prepare text. Its primary function, however, is as a program editor. Offers the full flexibility of the keypad while offering instant feedback in the form of full-screen editing. $55.

Omicron, Atlanta, GA

Crossref. A program that cross references variables in other programs.

Crossfire. A video game.

Drwboard. A program that lets you create your own pictures. All three, $27.

Omric, Newington, CT

Screen Machine. A series of machine language routines callable from Pascal, Fortran, Cobol, and assembly language. The routines facilitate cursor positioning, scrolling, and text manipulation. Requires 128K with Pascal and Fortran. $49.95.

Personal Systems Technology, Laguna Hills, CA

PC-Edit. A new full-screen editor for the IBM Personal Computer that is designed to be a full-function editor without sacrificing ease of use. Enhances programmer productivity through efficient and flexible control of source text files. $99.

Insta Drive. A software system that turns a portion of RAM memory into an instant-access disk drive. Designed as a performance enhancement for PC-DOS, it allows up to a maximum of 320K to be defined as virtual disk drive. $49.95.

ProActive Systems, Palo Alto, CA

ProEdit. A full-screen editor written in Basic that uses program function keys, cursor movement keys, and short mnemonics to execute commands. Can move, copy, delete lines or blocks of text; performs individual, selective, or global changes. Horizontal and vertical scrolling. $50.

ProSort. An insertion sort that reads file data, selects records according to user specifications, and sorts them into an output file. Accepts as many as eight input files. Can sort over a thousand records per minute. $75.

Prodata, Boise, ID

Easyscreen/pc. A block-mode screen design editor, keyed database access method, and a program generator. Allows quickly drawing screen design right on video; automatically generates a Basic program to input data from screen and access a keyed database file. Includes a data-list utility. $169.95.

KSAM/PC. A keyed database-access method. Allows accessing records on a disk file with a meaningful key field that is part of the record. Can be included in Basic programs. Commands include create, open, close, read by key, read next, write, rewrite, and delete. Also works on hard disk. $69.95.

Professional Software Associates, Minneapolis, MN

Pac. Removes all comments and extraneous spaces from pc basic source code. Can be merged or compiled. Line concatenation with user-defined length. Increase program speed and also provide source protection. Average program reduction is forty percent. No file size limitations. $45.95.

Cref. Generates a cross reference listing of program variables and line usage. Separate menu selection will output transfer statements along with the objects of transfer. Summarizes dimension/erasure of arrays, random file I/O, machine language calls, function usage, and listing of all Basic keywords with line usage. $34.

Quest Research, Huntsville, AL

Edlin Recover. Have you ever lost all of the Edlin modifications you made because the disk was full? This program will retrieve your file from memory. $35.

Diskpak. Now you can recover erased files. A menu-driven utility that permits the user to display or get a hexadecimal dump of any absolute disk sector. Also provides the capability to rebuild a disk directory that was accidentally destroyed. $35.

SimSoft, Marysville, MI

Software Development Modules. Forty commonly used ASCII routines used in Basic program development. $24.95.

PC Utilities. Creates and displays hidden or erased files. $29.95.

Screen Formatter. A software development tool that displays messages and edits input data from screen. $24.95.

Starside Engineering, Rochester, NY

Compress, by Mark S. Zachmann. File compression utility reduces the size of typical ASCII text files by 40 percent—pack more information on your archiving disks. Binary data files may or may not be significantly compressible depending on the nature of the data. Has on-line help. $19.95.

Synergistic Software, Renton, WA

Basic Programming Tools, by William Plice. An editing utility to ease programming in Basic on the IBM pc. Includes a full screen editor, automatic conversion of symbolic line labels to line numbers, listing with cross references, removal of remarks and blanks, and more. Basic source code and full documentation included. $120.

Tall Tree Systems, Los Altos, CA

JEL and JFormat. Features print spooling, ten sector formats (25 percent more bytes per disk), and electronic disk (DOS size variable without changing switches). PC-DOS 1.1 support for hard disks, 8" floppies, and quad drives (TM100-4). Reads, writes, and formats single and dual disks on quad drives, thus allowing a quad-only system. $50.

Versa Computing, Newbury Park, CA

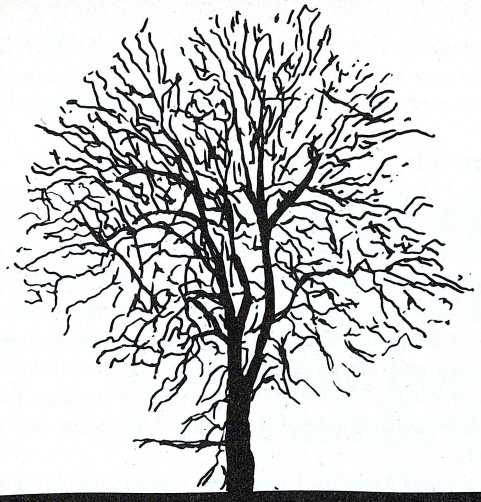
Font Editor System. Allows the user to generate and edit character fonts for use with Color/Graphics Adapter. Font tables can be loaded and saved to disk, and individual characters can be erased, drawn, substituted, inverted, reversed, shifted, flipped upside down, and restored. Instructions on font usage are included. $24.95.

Versa Prototyping Board. Implement custom circuitry on the IBM pc. Three thousand plated through holes on 10 mil centers, some in triple pads and some in buss rails, are suitable for either wire wrap or solder construction. Completely compatible with the Scotchflex Bread Board System. $59.95.

World Wide Software Publishers, Berkeley, CA

Forth for the IBM Personal Computer. Includes a full-screen editor, assembler, memory dump, and disassembler. This version is based on the fig-Forth model with all useful 79-Standard words added. $75; documentation only, $25.

Forth Source for the IBM Personal Computer. Allows you to create your own version of Forth. Can be used to create custom applications. $300.



HARDWARE

Sycamore

Amtek Systems, Richardson, TX

Power Siftor. Guards against damaging power line pollution. Protects your IBM Personal Computer and peripherals from lightning, voltage spikes (common and normal mode), and provides ride-through assistance on power flickers. Solid-state, attractive, lightweight, no noise or heat. From $300.

Applied Creative Technology, Arlington, TX

Mediamix ETI Electronic Typewriter Interface. Converts an IBM model 50, 60, or 75 electronic typewriter into an RO printer. Features include a 2K buffer, over thirty-nine automation commands, and the option of doing typesetting on the IBM ET50. Also available for Olympia and Adler/Royal electronic typewriters. Requires either a Centronics parallel or RS-232C asynchronous serial printer port. $495, plus options.

Printer Optimizer. Hardware printer or modem spooler with 64K to 256K memory buffer. Keyboard/display on unit allows user entry of character translation changes where any ASCII value or string can be converted into one or more ASCII values. Also push-button automation of up to ninety-nine printer functions. Parallel unit, $495; serial communications board, $125; 64K Optimem modules, $125.

AST Research, Irvine, CA

MegaPlus. This pc-compatible card offers a maximum of eight functions using one slot. The functions include 64K to 256K of memory, the Megapak option that expands storage to 512K, optional parallel printer port, serial port, optional serial port, clock/calendar, and *SuperDrive* and *SuperSpool* software. From $595.

ComboPlus. This card offers a maximum of six functions: 64K to 256K expandable memory, clock/calendar, parallel printer port, serial port, and *SuperDrive* and *SuperSpool* software. From $495.

I/O Plus. This card offers a total of six functions: clock/calendar, serial port, optional serial port, optional parallel printer port, and *SuperDrive* and *SuperSpool* software. From $175.

Expansion Memory. Use this card to increase the system storage by 64K to 256K. When used with the *SuperDrive* and *SuperSpool* software packages, it can enhance your computer performance tremendously. From $395.

Byad, Barrington, IL

DS Series Expansion Circuit Boards. True CP/M for your pc. Includes Z80B processor and CP/M-80 operating system. When running CP/M-80, the IBM processor and memory become an intelligent buffered I/O processor. DS1, $600; DS2, including serial port. $760.

Columbia microSystems, Columbia, MO

CMS 1600. Dual half-height 8" floppy disk drives in a cabinet designed to be placed on top of the pc. Full storage capacity is 2.4 megabytes formatted, includes low-loss power supply, fan and user-serviceable fan filter, power-line filtering, signal cable and a removable AC power cord. Requires disk drive controller and CP/M-86. $1,750.

Computer Technology Innovations, Sunnyvale, CA

Internal Hard Disks. Six to eighteen megabytes. $1,595.

External Hard Disks. Six to forty megabytes. $1,895.

5¼ Inch Internal Drives. 640 to 1,600K on two drives. From $575.

5¼ Inch External Drives. 640 to 1,600K on two drives. From $995.

Eight Inch Thinline External Drives. Twenty-four megabytes on two drives. $1,595.

Disk Controller Board. Usable for both 5¼ inch and 8 inch systems. $175.

RAM Boards. 65K to 512K. From $189.

Serial Boards. With one port, $95; with two, $125.

Multi-Function Boards. Serial and parallel ports, game adapter, clock calendar. $225. With 64K, $495, with 256K, $750.

Corona Data Systems, Westlake Village, CA

Corona Personal Hard Disk. Five-and ten-million-character hard disks that fit right inside the pc without an attachment on the outside. Compatible with most business and management software. $1,995, five megabyte; $2,495, ten megabyte.

Cuesta Systems, San Luis Obispo, CA

Datasaver. An A.C. power back unit that provides continuous, clean power to microcomputers using its built-in battery and charger. In addition, *Datasaver* can make systems completely portable by plugging in an auxiliary twelve-volt battery. Precision crystal frequency standard and overvoltage suppressor are designed in. Available in domestic and foreign power configurations. 200-watt model 20012060, $695.

Voltage Surge and Transient Suppressor. Electronically removes sudden overvoltage changes that affect performance of sensitive electronic equipment. It is plugged into an A.C. line power receptacle on same 15-20 amp breaker circuit. Solid-state semi-conductors clip all overvoltage surges beyond 132 VAC and passive filter network snubs high frequency transients. An internal fuse provides safety protection for transzorb. $29.95.

Datasouth, Charlotte, NC

DS180. A high-speed dot matrix printer that features nine by seven characters with true descenders. Here is a commercial-grade printer designed for serious users of the pc. The printer features both serial and parallel interfaces, prints bidirectionally at 180 characters per second, and has selectable baud rates of 110 through 9,600. A front panel keypad allows users to program up to fifty features, that are stored within a nonvolatile memory that is not lost when the printer is turned off. $1,595.

Davong Systems, Mountain View, CA

Winchester Disks. 5.2 or 12 megabyte, internal. $1,995 or $2,695.

RAM Cards. 64 to 256K. From $299.

Serial Card. Dual asynchronous card with cables and software. $199.

Combination Card. Dual asynchronous card with 64K, expan-

dable to 256K. $499.

Giltronix, Palo Alto, CA

Selecto Switches. A line of switches allowing one port to drive up to six devices. Configures for parallel or serial port. From $159.

Automatic Switching Units. Switches designed to connect a computer to as many as seven devices, with automatic switching between them. From $449.

Hayes Microcomputer Products, Norcross, GA

Chronograph. RS-232C compatible calendar/clock ideal for accurate time-keeping applications. Features day, date, and time reporting via RS-232C communication as well as a local six-digit vacuum fluorescent display. Includes battery backup system, twelve or twenty-four hour operation at 300 or 1,200 baud with automatic baud rate detection and parity sense detect. Requires IBM Asynchronous Communications Adapter and a correctly wired RS-232C cable. $249.

Smartmodem 300. Connects directly to the phone line and your pc's RS-232C port to communicate with remote computers from 0 to 300 baud. Executes and responds to your commands and special parameters settings. Features include audio monitor indicator lights for a visual status check, Touch Tone or pulse dialing, full or half duplex, autoanswer/dial, programmable in any language, two-year limited warranty. Requires IBM Asynchronous Communications Adapter and a correctly wired RS-232C cable. $289.

Smartmodem 1200. High-speed version of the popular *Smartmodem 300* with identical operating features. Operates at 1,200 bps or at 0 to 300 baud. Compatible with Bell 212A-type modems. Extensively tested, compact design, competitively priced. Both modems are FCC approved for direct connection to any U.S. telephone system. Requires IBM Asynchronous Communications Adapter and a correctly wired RS-232C cable. $699.

Hercules Computer Technology, Hercules, CA

Hercules Graphics Card. Bit-mapped graphics at 720 by 348 resolution on the monochrome display. Software-compatible with the IBM monochrome board and has the printer function and the same style character set. A full set of graphics subroutines is also available. $599.

Hewlett-Packard, San Diego, CA

The Hewlett-Packard 7470A Graphics Plotter. The perfect gift for the home hobbyist or the business professional. The plotter can draw multicolor graphs or text charts—even do your own greeting cards. It plots on paper or overhead transparencies. Requires asynchronous communications adapter. $1,550.

Kraft Systems, Vista, CA

Precision Joystick. High-performance precision joystick designed for plug-in compatibility with the pc. Features unique, friendly spring-centering or free-floating stick modes, selectable at the flip of a switch. Trim controls X and Y axes to fine-tune stick response. Long-life, custom potentiometers ensure linear cursor control. Full one-year limited warranty. $69.95.

Paddle Pair. These high-quality, precision controls feature long-life custom potentiometers, fatigue tested to over two million cycles without failure. Unique 180-degree knob rotation provides extremely quick and accurate cursor control for higher game scores and better graphics performance. Full one-year limited warranty. $49.95.

Microcomputer Business International, Irvine, CA

Megaram. IBM pc-compatible memory board, expandable from 64K to 1 megabyte on a single board plus two DOS-compatible RS-232C serial ports. Features such as parity, programmable banking, and write protect on a high quality fully socketed board. From $395.

Micromatch, Tujunga, CA

MM77-1 Prototyping Board. Up to 96 sixteen-pin integrated circuits can be accommodated on this full-size board. Circuits on .3, .4, .6, or any separation up to three inches will fit. Mounting hardware and complete documentation is included. Circuitry is provided for an optional thirty-seven-pin subminiature D connector. $50.

MM39-1 Extender Board. This board extends any expansion bus connector up and above the pc system unit. Both sides of the extended board are then easily accessible for testing. Boards are secured in place with supplied hardware. Complete user's manual included. $45.

MM64 Series Memory Expansion. User-expandable 64K to 256K memory boards that plug directly into the pc. All boards include parity and are supplied with a complete manual and memory test disk. Mounting hardware included. Five-year warranty. $400 to $730.

Microperipheral Corporation, Redmond, WA

PConnection. A direct-connect, Bell 103/113-compatible modem card that fits inside the pc cabinet. Autodial (Touch Tone or pulse), autoanswer in originate and answer modes. Contains modulator-demodulator, high-performance channel filters, originate-answer switching, and carrier detection circuitry. Contains an additional RS-232 port. $350.

Nomon Microcomputer, Wales, MA

MRS Switch. Don't be out to lunch when the power goes out! Manual Reset Switch has a warning light and requires power to be manually reset after power failure or disconnect. Protects autostart drives and is critical for hard disk systems that require sequential power-up procedures. Ten amps. $39.75.

PC Squared, Sunnyvale, CA

Winchester Disks. Six to eighteen megabyte internal. From $1,895.

Controller. Runs hard disks in PC-DOS. $950.

RAM Boards. 64 to 256K. $289. One or two serial ports, $30 extra for each.

Percom Data, Dallas, TX

Forty Track Add-In. Five and one-fourth inch floppy disk drive internal model, comes in single head or dual head configurations. Includes power supply, installation brackets, and necessary documentation. Single head unit, $375; dual head, $525.

Forty Track Add-On. Five and one-fourth inch floppy disk drive, external model, comes in single or dual head configurations. Includes power supply, a case for external compatibility, and necessary documentation. Single head unit, $475; dual head, $625.

PHD. Five and one-quarter inch Winchester hard disk drive, comes in five, ten, fifteen, and thirty megabyte models. First drive has smart microprocessor controller for up to three additional PHD add-ons. Simple installation, all necessary hardware provided. First drive, five megabyte, $2,450; second drive, additional add-ons. $1,950.

Periphex, Southbury, CT

The I-Queue. The intelligent printer buffer that saves you time and money by freeing your pc from the printing task. This small circuit board containing a clock/calendar provides sophisticated word processor functions while replacing the IBM printer adapter. $495; 64K expansion option, $175; interface cable for IBM pc printer (Centronics type), $50.

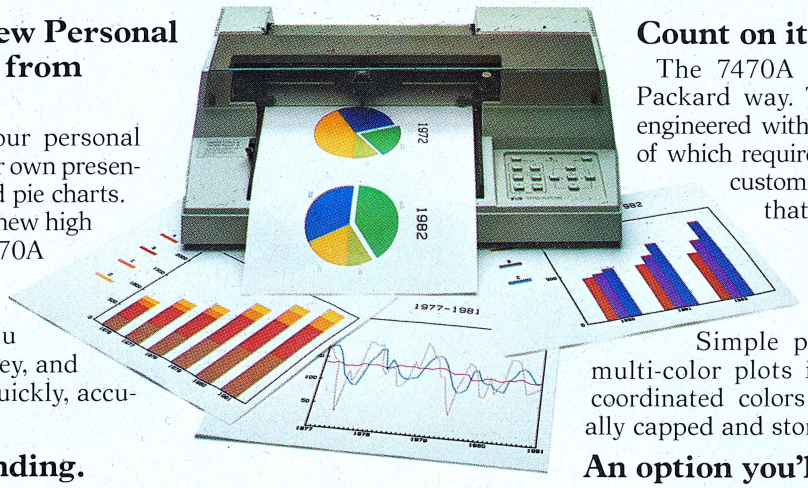
Plot your next meeting yourself.

Read how 2 pens can become your best presentation tools.

Introducing the New Personal Computer Plotter from Hewlett-Packard.

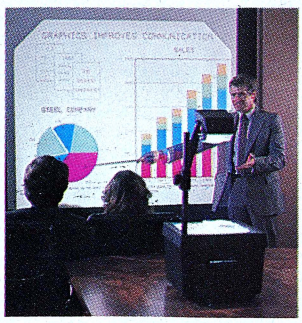
Now you can use your personal computer to generate your own presentation charts, graphs, and pie charts. How? Simply add on the new high quality, low cost HP 7470A Personal Computer Plotter.

The 7470A helps you save time and save money, and lets you communicate quickly, accurately and *effectively.*



Quicker understanding.

Data, when visualized graphically, becomes information fast. Charts and bar graphs can make any presentation clearer and more readily understood. But asking your staff to produce the graphics manually for your next presentation doesn't ensure accuracy or artistic talent. And going to outside graphics suppliers can be costly. Combined with your personal computer, the new HP 7470A plotter does the communicating for you. Quickly. Logically. And with off-the-shelf software available from most HP dealers.



Fast and pretty.

The 7470A gives you high plotting speed with excellent line quality...faster than any competitive small plotter. On top of all that, it comes in an attractive design package that looks nice on your desk. And it does it for only $1,550. (U.S.A. domestic suggested retail price.)

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Pen pals.

The HP 7470A has two single-pen stables. Simple pen changes give you multi-color plots in your choice of ten coordinated colors. Pens are automatically capped and stored.

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For only $95, you can also get a 17057 Overhead Transparency Kit that turns your plots into transparencies for overhead projectors. For "I need it tomorrow at 9:00 A.M.!" meetings, it's a necessity.

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Ultra-modem. A complete 300 baud data communications system. Provides all the facilities to originate and answer calls, auto dialing (both pulse and tone), and completely unattended auto answer. All on just one plug-in board housed in the pc. $495.

Personal Systems Technology, Laguna Hills, CA

Spectrum Multifunction Board. The Spectrum Series multifunction board provides the pc user with up to 256K of field-expandable memory, two asynchronous communications lines, and a parallel printer port—all on a single, full-length circuit board. Available in twenty-four different configurations, all field-upgradeable to a fully populated board. From $435.

Plantronics/Frederick Electronics, Frederick, MD

Colorplus High Resolution Color Graphics Adapter. Enables the displaying of four-color high resolution and sixteen-color medium resolution graphics without sacrificing software compatibility. Its innovative two-memory plane technology features the ability to overwrite displayed graphics. Includes an integrated parallel printer port and interactive business graphics software. $995.

Quadram Corporation, Norcross, GA

Quadboard II. An all-on-one board with two serial RS-232 asynchronous adapter ports, a clock/calendar, and memory expansion up to 256K. The serial ports can be used for modems, printers, and other serial devices. Memory expansion is socketed and expandable in 64K increments. Full parity generation and checking. Dip switches allow selective addressing on any 64K block. The clock/calendar eliminates inputting the date manually, and an on-board battery with a five-year guarantee keeps the clock running when the computer is off. From $595 for 64K to $995 for 256K.

Quadboard. The original all-on-one board with one Centronics parallel printer port, up to 256K RAM, a real-time clock/calendar, and a serial RS-232 asynchronous communications port. The parallel and serial ports are functionally identical to IBM's. Dip switches provide for addressing the serial and parallel ports as main port or auxiliary port. The clock/calendar uses a crystal-controlled integrated circuit with a rechargeable battery guaranteed for five years. Each of up to four rows of 64K chips has a switch for enabling or disabling the specific row—a feature unique with Quadboard. *QuadMaster* software with clock routines, diagnostics, utilities, and QuadRAM Drive, super-fast solid-state disk drive in memory are included at no extra cost. From $595 for 64K to $995 for 256K.

Quad 512 Plus. Expansion board that contains a serial RS-232 asychronous port and up to 512K RAM in increments of 64K, 256K, or 512K. The asynchronous communications adapter uses the same chip as the IBM asynchronous board, and is used for connecting modems, printers, and other serial devices. The board fully supports IBM communications software. *QuadMaster* software with QuadRAM Drive is included at no extra cost. $475 for 64K, $895 for 256K, and $1,295 for 512K.

Quadcolor. Color video cards that are functionally equivalent to the IBM pc cards but with many additional features. Allows color bit-mapped graphics with sixteen colors on the screen at one time, with each color dot addressable. An additional upgrade allows for improved resolution of 640 dots per line and 200 dots vertically. A final upgrade of the card allows for bit-mapped resolution of 640 by 400. Under $300; fully upgraded, $800.

Street Electronics Corporation, Carpinteria, CA

Echo Speech Synthesizer. A text-to-speech voice output peripheral with an unlimited vocabulary. All you do is type what you want to say and your pc does the rest. $300.

System 300, Sacramento, CA

Save-a-Slot. A piggy-back board that mounts in the same area as the original 64K and allows up to 256K of dynamic memory to be placed on the system board. Eliminates the need to use an expansion slot to upgrade your system memory. Board only, $49.95; with sockets and caps, $149.95; complete kit, from $265.95; installed and tested, from $299.95.

Tallgrass Technologies, Overland Park, KS

HardFile. A six to twenty megabyte Winchester disk system. From $2,995.

Tape Backup. For use with hard disks. $1,695.

Interface. Makes HardFile compatible with PC-DOS. $149.

Tall Tree Systems, Los Altos, CA

JRAM. A 512K RAM board. All 64K dynamic RAM locations are socketed, all memory is parity checked, and memory relocates on any 64K segment boundry. Software-controlled hardware pager overcomes pc memory limitations and as such is the only add-on for users desiring more than 576K of memory. $1,000.

Terminus Design, Ellenwood, GA

PC Arcade Interface. Animated color video graphics performed by the powerful TMS9928A. Eight channels of analog-to-digital conversion parallel I/O; and IBM joystick-compatible. Nine channels of sound generation with digital filtering and on-board stereo amplifier. Optional Votrax SC-01A speech synthesis with enhanced intonation control. All on one board. Without speech: $385.

TG Products, Plano, TX

Joystick. High-quality joystick made by the oldest and largest manufacturer of game and graphics input accessories. Made from custom-designed components to be completely linear over the entire input range. Has two large buttons, molded cable, and exclusive trim to perfectly match the unit to your pc. Requires game adapter. $64.95.

Trak-Ball. An exciting new game and graphics input device consisting of a ball which is rolled with the palm of the hand to quickly and accurately position objects on the screen. Designed for years of reliable play and produced from quality components. Requires game adapter. $64.95.

Vector Electronic Company, Sylmar, CA

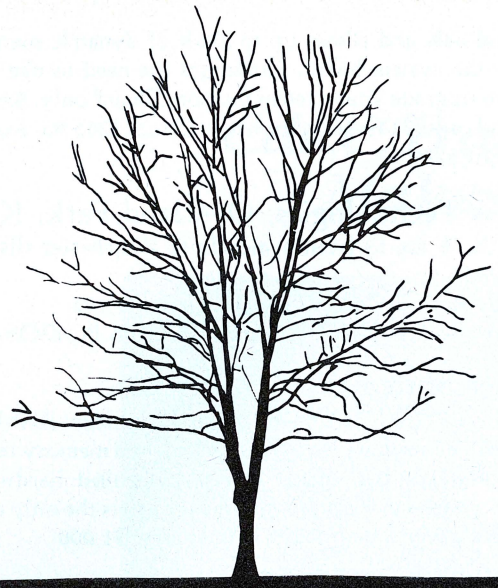
Vector-RAM. A memory expansion board with up to 256K of dynamic RAM. Combined with one serial I/O, one parallel I/O, and a time/date clock with battery backup. Thoroughly tested with complete documentation. $995.

Prototyping Boards. Three prototyping boards complete with mounting brackets, hardware, and component layout sheets. P/N 4613 has solder pads, $39; 4613-2 is for wire-wrapping, $36.95; 4613-1 is a bare board, $26.95. An extender board, P/N 3690-22, for testing and measurement, $22.35.

Votrax, Troy, MI

Votrax Personal Speech System. Equipped with both serial and parallel interface, this system allows virtually any computer to talk. It employs a highly articulate text-to-speech translator, achieving a translation accuracy rate of at least 95 percent for conversational vocabulary. Additionally, the Votrax PS System, which has a speaker built in, is capable of providing simultaneously either speech and sound effects, or speech and music. Cable required. $395.

Votrax Type-'n-Talk. Automatically translates your text into electronic speech and allows your computer to speak with an unlimited vocabulary. Standard with an RS-232C interface, it utilizes an internal microprocessor and 750-character buffer. Additionally, it doesn't use your computer's memory to make your text speak. Cable and speaker required. $249.



ACCESSORIES

Pecan

Compucart, Tampa, FL

Compucart. An ergonomically designed mobile computer work station. The keyboard shelf pulls out at the correct height for comfortable interactive entry and is vertically adjustable to accommodate most personal computers and terminals. Offers security by returning the computer to the closed position when not in use or running unattended, the roll-down tambor door is closed and the whole work station, hardware and software, is secured with one lock. $595.

Computer Case Company, Columbus, OH

Personal Computer Case. $129.
Monitor Case. $99.
Printer Case. $89.
Accessory Case. $95.

Curtis Manufacturing, Winchester, NH

P.C. Pedestal. A tilt and swivel base for the pc monochrome display. Three hundred degrees swivel, twenty-five degrees up tilt, fifteen degrees down tilt, same texture and color as display. Allows operator total freedom in placement of display's angle to eliminate glare, eye strain, or fatigue. Increases production at the same time it decreases errors. $79.95, plus $3 for shipping and handling.

Extension Cables Monochrome Display. Two three-foot cables: one A.C. cable and one I/O cable totally shielded with shielded industrial quality connectors. Allows freedom in placement of systems unit in relation to display. $49.95, plus $3 for shipping and handling.

Extension Cable Keyboard Coiled. Black coil cord with working range of three to ninety feet, totally shielded with high quality shielded connectors to prevent any leakage or television interference. $39.95, plus $3 for shipping and handling.

Extension Cable Keyboard Straight. Same as above except no coil, just a straight length of eight feet. $34.95, plus $3 for shipping and handling.

Nat Hellman III, South Gate, CA

Keyboard Dustcover. Made from rigid, smoked-bronze plastic, this cover is designed to protect the computer keyboard from dust and dirt. Originally designed for the pc, the dustcover is compatible with at least ten other systems. $12 prepaid. Group and dealer discounts available.

Disk Drive Cover. Designed to protect both disk drives from harmful elements. It is constructed of black plastic with a vinyl-foam seal to ensure full protection for the disk drive areas. Has a front handle which makes it easy to insert and remove. The design highly complements styling of the pc. $8, prepaid. Group and dealer discounts available.

JC Computer Specialists, Federal Way, WA

Memory Joggers. An 8½ by 14 inch board that contains commands, functions, and statements in three colors. Comes in two styles, one for Basic and the other for DOS, Edlin, Debug, and Link. A useful tool for the experienced programmer and a must for the new programmer. $10.

DM Tucker, San Francisco, CA

Key Kue Function Key Finder. A cue card designed to fit over and alongside the function keypad on which users can identify the functions of each key for a particular application package. Eliminates requirements for repeated displaying of help screens. Attractively designed and professionally manufactured to complement the pc keyboard. $3.95.

PUBLICATIONS

Pignut Hickory

Architecture Technology Corporation, Minneapolis, MN

PC Perspective, J. Scott Haugdahl, contributing editor. Monthly newsletter for the professional whose work includes the use of the IBM Personal Computer. Topics covered include new products, new software, hardware technology, user experiences, general news, local computer networks, office automation uses, and factory automation and process control uses of the pc. No advertising will be accepted. $195 per year, USA; $245 per year, foreign.

Blue Water Systems, Oceanside, CA

Guide To Converting Applesoft Programs To IBM Basic, by Paul Lever. A step-by-step guide to transporting programs written on the Apple to the IBM. It includes discussions of the difficulties involved, cookbook changes, random access and sequential files, graphics and downloading. This booklet will save you hours of conversion effort. $15.

I. B. Magazette, Shreveport, LA

I. B. Magazette. Monthly program and information exchange on disk that features public domain software, hints, tutorials, and so

forth. Subscribers copy wanted programs and files, then return the disk with their input of comments, programs, or other information to be shared. Initial issue $15; subsequent issues, $10 with return of disk.

L. J. Kutten, Clayton, MO

Consumer Protection for the Microcomputer Owner. This booklet can save you money and grief. Points covered include what warranties really are, how legally to reject and revoke your purchases, pitfalls of paying by cash, check, and so forth, and how to order by mail. $15.

Sapana Micro Software, Pittsburg, KS

Software/Hardware Directory and Reference Guide for the IBM Personal Computer. A semiannual directory with updates published monthly. Includes columns on software, hardware, consulting services, supplies, retailers, and help wanted. Updates include free listings of user groups and article indexes. Free sample issue to pc users. $10 for one directory and six updates.

Sybex, Berkeley, CA

Basic Exercises for the IBM Personal Computer, by J.P. Lamoitier. Covers a broad range of tasks from tax computations to statistical calculations to sales forecasting. Step-by-step exercises lead the reader from a conceptualized problem to an actual Basic solution to be run on the pc. Covers applications in math, physics, games, business, accounting, and statistics. $13.95.

Wildfire Publishing, Carpinteria, CA

Your Fortune in the Microcomputer Business, by Victor Wild.

Volume One, *Getting Started,* shows how to survey the market, how to select the right product or service, how to get startup capital, and what steps to take establishing a business.

Volume Two, *Growth, Survival and Success,* deals with the problems and decisions a person faces when their microcomputer business really takes off.

Lets the reader in on the secrets of microcomputer business startup and success. A complete and practical reference. $15.95; both books, $24.95.

An Index of Stocking Stuffers

Aardvark Software, 783 North Water Street, Milwaukee, WI 53202; 414-289-9988.
ABW, Box M1047, Ann Arbor, MI 48106; 313-971-9364.
Acorn Software Products, 1945 Gallows Road, Vienna, VA 22180; 703-556-9788.
Aeon Concepts, Box 12595, Pittsburgh, PA 15241; 412-831-5352.
Alkazar Associates, 2638 South Lynn Street, Arlington, VA 22202.
Alpha Software, 6 New England Executive Park, Burlington, MA 01803; 617-229-2924.
Amtek Systems, 903 Business Parkway, Richardson, TX 75081; 214-238-5300.
Applied Creative Technology, 2723 Avenue E East, Suite 717, Arlington, TX 76011; 800-433-5373.
Architecture Technology Corporation, Box 24344, Minneapolis, MN 55424; 612-935-2035.
Arlington Software Systems, 97 Bartlett Avenue, Arlington, MA 02174; 617-641-0290.
Armonk, 610 Newport Center Drive, Newport Beach, CA 92660; 714-760-3955.
Artificial Intelligence Research Group, 921 North La Jolla Avenue, Los Angeles, CA 90046; 213-656-7368.
Ashton-Tate, 9929 Jefferson Boulevard, Culver City, CA 90230; 213-204-5570.
AST Research, 2691 Richter Avenue, Irvine, CA 92714; 714-540-1333.
Beaman Porter, Pleasant Ridge Road, Harrison, NY 10528; 914-967-3504.
Bit Software, Box 619, 1048 Nicklaus Avenue, Milpitas, CA 95035; 408-262-1054.
Blaise Computing, 1465 Seventeenth Avenue, San Francisco, CA 94122; 415-665-4711.
Blue Water Systems, Box 1877, Oceanside, CA 92054.
Broderbund, 1938 Fourth Street, San Rafael, CA 94901; 415-456-6424.
Business Master, 4317 Seabright Drive, Carlsbad, CA 92008; 714-729-0300.
Byad, 101 Lions Drive, Barrington, IL 60010; 312-381-2330.
Carter L. Cole Company, 6355 Topanga Canyon Boulevard, Suite 407 Woodland Hills, CA 91367; 213-884-7169.
ColorCorp, 208 North Berkshire, Bloomfield Hills, MI 48103; 313-335-2255.
Columbia microSystems, 110 North Tenth Street, Columbia, MO 65201; 314-875-8900.
Compucart, 201 North Rome Avenue, Tampa, FL 33601; 800-237-9024.
Compu-Quote, 6914 Berquist Avenue, Canoga Park, CA 91307; 213-348-3662.
Computer Case Company, 5650 Indian Mound Court, Columbus, OH 43213; 614-868-9464.
Computer Control Systems, 298 Twenty-first Terrace S.E., Largo, FL 33541; 813-586-1886.
Computer Systems Design, Box 735, Yakima, WA 98907; 509-575-0320.
Computer Technology Innovations, 1037 North Fair Oaks Avenue, Sunnyvale, CA 94086; 408-745-0180.
Computrickx, 129 Saratoga Court, Petaluma, CA 94952; 707-763-9700.
CompuView Products, 1955 Pauline Boulevard, Ann Arbor, MI 48103; 313-996-1299.
Conversions To Go, 1207 Elm Avenue, Suite M, Carlsbad, CA 92008; 714-434-6165.
Corona Data Systems, 31324 Via Colinas, Westlake Village, CA 91361; 213-706-1505.
Cuesta Systems, 3440 Roberto Court, San Luis Obispo, CA 93401; 805-541-4160.
Curtis Manufacturing, One Curtis Road, Winchester, NH 03470; 603-239-6807.
Data Consulting Group, 877 Bounty Drive, Foster City, CA 94404; 415-349-4001.
DataMost, 9748 Cozycroft Avenue, Chatsworth, CA 91311; 213-709-1202.
Datasmith Micro Software Systems, Box 8036, Shawnee Mission, KS 66208; 913-381-9118.
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System 300, 3030B Q Street, Sacramento, CA 95816; 916-452-1476.
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DM Tucker, Box 31464, San Francisco, CA 94131.
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BUILD THE SPARROW:

A BUDGET MODEM FOR YOUR CASSETTE PORT

by Larry Reagan

The Sparrow is an ultra-low-cost data communications device designed for the IBM Personal Computer. The Sparrow uses standard modem techniques through the pc's cassette connector. This enables you to communicate with other systems over phone lines, without having to use an asynchronous communications adapter.

The Sparrow is considerably simpler than standard modems. You can construct it in about two hours for about $60. The software provided with this article, in conjunction with the Sparrow, allows you to use your pc as a dumb terminal connected to a remote host.

Data communications capability gives your computer the power to share resources with other systems. Timesharing services such as the Source and CompuServe provide subscribers with access to the latest news, stock prices, games, and many other databases.

With communications you can also take advantage of the many computer bulletin board services (BBSs) through which dedicated hobbyists and computer dealers provide free data exchange (messages and public domain software) to anyone who dials up. There are several hundred BBSs scattered throughout the country. The potential for information exchange on these systems is enormous.

Standards for Data Communications. The most widely used standard for computer-phone communications is the Bell 103 standard. This standard specifies the data rates and tone frequencies for a modem. Most commercial modems use acoustic couplers or a direct access arrangement (DAA) to achieve interface with the phone lines. The computer side of the modem usually interfaces by means of a standard known as

The Sparrow is an acoustic coupled modem that plugs into the pc's cassette port and doesn't require an RS-232 interface. The model pictured left and below is encased in an ordinary tape cassette storage tray.

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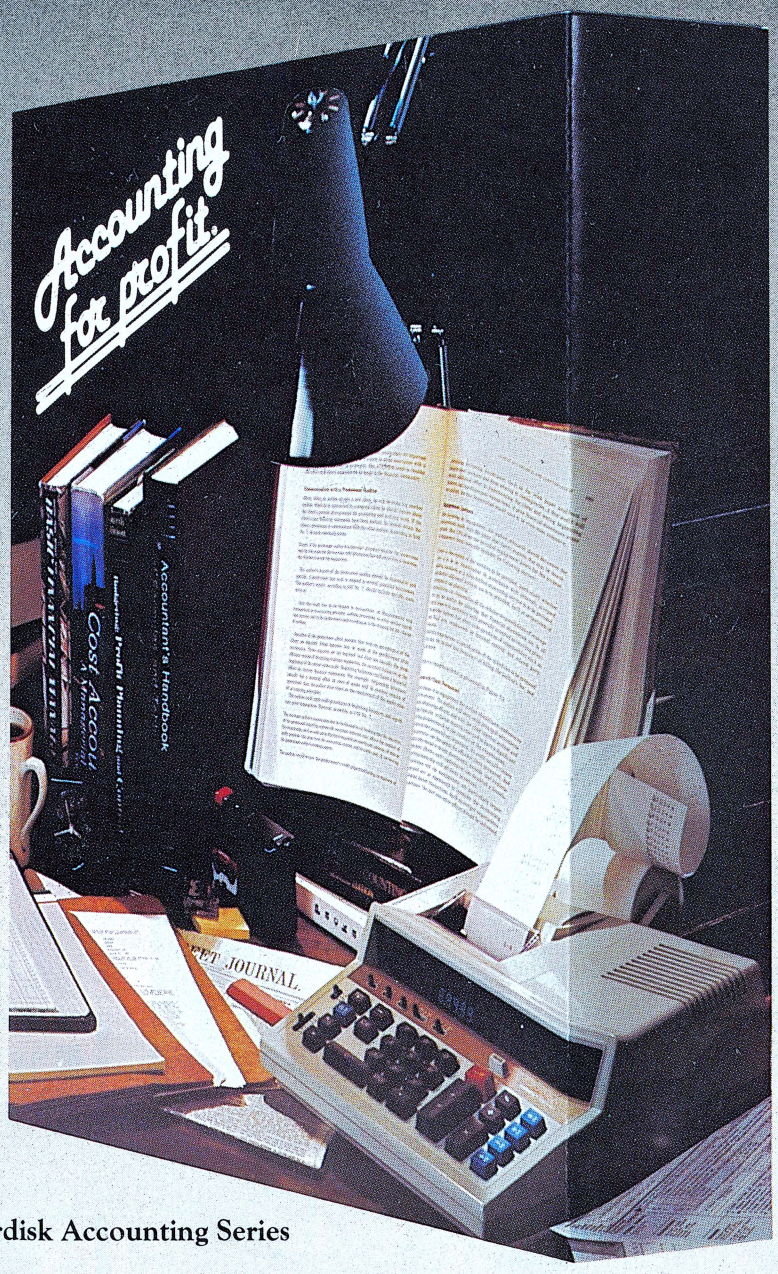

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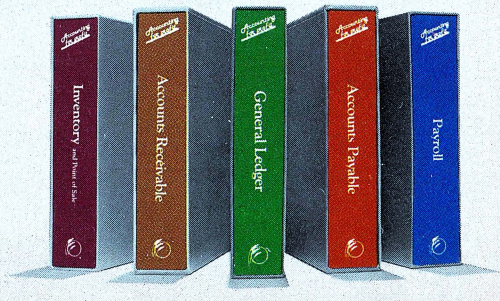

EIA RS-232. This is the standard used by IBM's Asynchronous Communications Adapter.

There is no slot penalty for using the Sparrow. It turns out that about 75 percent of the hardware needed to implement a modem is already present in the cassette interface. The Sparrow performs in software many functions performed in hardware by the asynchronous communications adapter.

Additionally, the software does the tone modulation and demodulation for Bell 103. The Sparrow hardware is used to interface the telephone receiver physically and to filter out unwanted noise. Acoustic rather than direct-coupled techniques are used so that the phone system won't be accidentally damaged.

The Sparrow features answer and originate operation modes; full duplex and half duplex display modes; baud rates of 110, 150, and 300; space, mark, even, and odd parity; and 0–255 stop bits. You should familiarize yourself with the meaning of these options before using the Sparrow.

If you were to dial up a network, you would be considered to be an *originate* system. The system that answers the call is an *answer* system. If a system were to call you, your computer would be the answer system and the remote system would be the originate system.

The Bell 103 standard specifies that a logical 1 (called a *mark*) generated by the originate system is a tone at 1,270 Hz. A logical 0 (a *space*) generated by the originate system is a tone at 1,070 Hz. A mark generated by the answer system is a tone at 2,225 Hz. A space generated by the answer system is a tone at 2,025 Hz.

Bell 103 is a full duplex standard. In other words, a set of tones is generated simultaneously by both the answer and originate systems. When no data is being transferred, the originate and answer systems are in the mark states.

Terminal equipment interprets the terms half duplex and full duplex differently than Bell 103 does. The Sparrow half duplex display mode causes each key to be displayed on the screen before it's transferred. The Sparrow full duplex display mode does not display keys as they're depressed. When a key is depressed by the originate system, the signal is transferred to the answer system; the answer system echoes the key back to the originate system where it's then displayed on the screen. Full duplex gives the operator visual feedback to assist in error detection and for that reason is the more commonly used display mode.

The term *baud rate* refers to the speed of data transfer, measured in bits per second. In a typical system using one start bit, seven data bits, a parity bit, and one stop bit (making a total of ten bits per character), the effective data rate at 300 baud is thirty characters per second.

The parity bit transmitted with each character is used for error detection. The Sparrow software always assumes a start bit, seven data bits, a parity bit, and 0–255 stop bits. A system that specifies "eight bits, no parity" would require you to set the Sparrow for *space* parity. A system specifying "seven bits, no parity" would require that the Sparrow be set for *mark* parity.

Even parity means that for every character, the seven data bits together with the parity bit contain an even number of ones. If the Sparrow is set for even parity and it receives a character with an odd number of ones, it will display a *paragraph* symbol (a backward *P*) to indicate a parity error. A system using "seven bits, odd parity" requires *odd* parity on the Sparrow.

Most BBSs as well as the Source require space parity.

Stop bits are used to separate one character from the next. The Sparrow can insert up to 255 stop bits after each character; one or two are commonly used.

The pc Cassette Interface. The IBM pc cassette interface is designed to run at frequencies between 1 and 2 kHz. These frequencies are on the same order as those required by Bell 103. There is an Intel 8253 programmable interval timer inside the pc that's used to generate tones. Data normally received by the cassette interface is squared up by a MC1741 operational amplifier (op amp). The 8088 processor samples the op amp through an 8255 parallel interface chip and determines the frequency of a signal by measuring the time between pulses.

The cassette interface inside the pc system unit must be configured for "mic" in order to be used with the Sparrow. This is the configuration in which systems are shipped from IBM. If you have changed your cassette jumper to "aux," you'll need to change it back to "mic" before operating the Sparrow.

How the Sparrow Works. After the program has been initialized, Basic calls up the Sparrow driver. This program is an endless loop that continuously samples the receiver for input and checks to see if you've struck a key.

If a start bit is detected (that is, if the received tone changes from a mark to a space), the real-time clock hardware is reprogrammed to interrupt after one bit time has elapsed. The software then waits for the in-

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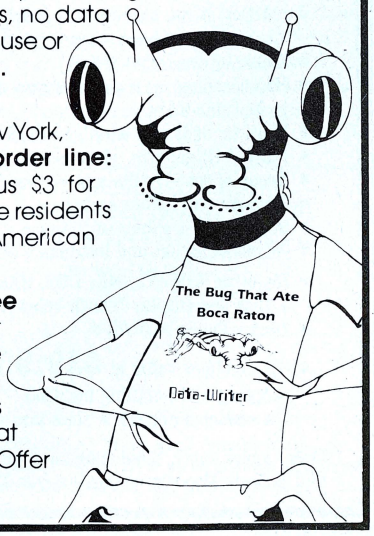

terrupt. When the interrupt occurs, the receiver frequency is measured to see whether the bit that went by was a mark or a space. The status of the receiver is saved as data bit D0. The real-time clock will continue to interrupt every bit time until eight samples have been taken. When these eight bits have been checked for parity and displayed on the screen, the program goes back to the search loop.

If a key is ready (that is, if you've pressed a key), the software checks for certain special characters; these special characters, if found, are not transmitted. If the key is to be transmitted, the real-time clock is programmed to interrupt at the bit rate. The software waits for a phase change in the transmit tone, then reprograms the 8253 to generate a space tone (for the start bit). The program then waits for the timer interrupt. When all data bits and stop bits have been transmitted, the program goes back to the search loop.

By typing *alt 129* on the number pad, you can make the program break out of its search loop and return control to Basic.

The Sparrow software has a few limitations. First, the real-time clock is used to control the baud rate. While the Sparrow is in use, therefore, the real-time clock can't serve its usual timekeeping function. As soon as you return to Basic, the real-time count is resumed.

Second, the bell character (control-G) doesn't cause a beep as it otherwise would. Since the beeper and cassette hardware are shared, the bell code must not sound. The Sparrow software instead displays a control character.

Third, data isn't transmitted in both directions simultaneously. Operation as a dumb terminal with data entry at keyboard speeds does not make this a serious limitation. If you plan to use the Sparrow for standard methods of file transfer, you may need to run in half duplex or to rewrite some of the software to support *xon*, *xoff*, and other protocols.

The Sparrow Hardware. The hardware design is fairly straightforward (see schematic). Two filters are used to condition the send and receive data. A "high" filter passes frequencies of 2,000 Hz to 2,300 Hz while filtering out other frequencies. The "low" filter passes 1,000 Hz to 1,300 Hz. In originate mode, the high filter cleans up the received data and the low filter cleans up the transmitted data. To operate in the answer mode, the filters are swapped by switches S1 and S2.

An op amp is used to interface a microphone (or a speaker used as a dynamic microphone) to the filters. Another op amp is

Sparrow parts list

C1–C4,C6,C7,C10,C11,C14–C17 ..... 0.01 uF
50 volt Mylar capacitor
(5 percent tolerance or better)
C5,C8,C9 ..... 0.1 uF 50 volt disk capacitor
C12,C13 ..... 470 uF
50 volt electrolytic capacitor
D1,D2 ..... 12 volt ½-watt zener diode
D3,D4 ..... 1N4001 diode
IC1,IC2 ..... LM348 quad op amp
J1 ..... 5 pin male DIN plug

R1 ..... 15 kilohms
R2,R14 ..... 160 kilohms
R3 ..... 18 kilohms
R4 ..... 2 megohms
(10 megohms if you're using a speaker as a dynamic microphone)
R5,R11 ..... 10 kilohms
R6,R9,R10 ..... 220 ohms
R7 ..... 330 ohms
R8 ..... 200 kilohms
R12 ..... 820 ohms
R13 ..... 22 kilohms
R15,R17 ..... 8.2 kilohms
R16 ..... 1.2 kilohms
R18 ..... 240 kilohms
R19 ..... 2.4 kilohms
R20,R22,R24 ..... 100 kilohms
R21 ..... 620 ohms
R23 ..... 1.5 kilohms
All resistors are ¼-watt, 5 percent tolerance

S1,S2 ..... Dpdt switch
S3 ..... Spst switch
SPK1 ..... Crystal microphone
or 2 inch 8 ohm speaker
SPK2 ..... 2 inch 8 ohm speaker
T1 ..... 117:12 Vac
transformer, at least 50 ma

Miscellaneous: Printed circuit board, enclosure, cups for speaker and microphone, four-conductor cable, solder, wire

The following is available from Microgrid, Box 613, Ithaca, NY 14850: a drilled and etched printed circuit board with documentation (includes machine language source listing) plus all parts, except speaker and microphone, enclosure, and transformer. The price is $45 plus $1.50 shipping and handling. New York residents add 7 percent sales tax.

The following is available from the Micromint, 917 Midway, Woodmere, NY 11598: two rubber cups, one crystal microphone, and one two-inch speaker—all intended for use as modem acoustic transducers. The price is $12.95 plus $2 shipping and handling. New York residents add 7 percent sales tax.

The following is available from Radio Shack: cassette storage tray (which can be used as an enclosure for the Sparrow), part number 44-665 ($3.49); 120:12 vac transformer @ 300 ma, part number 273-1385 ($3.29); microphone element, part number 270-088 ($1.69); 2 inch 8 ohm speaker, part number 40-245 ($2.49).

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used to interface the filters to a speaker for data transmission. The eight op amps shown in the schematic are packaged in two integrated circuits.

The power supply is a plus or minus twelve volt supply that uses an ordinary calculator-type transformer. Switch S3 is for power on/off.

The interface to the pc is through a standard five-pin DIN connector. If you're also using the cassette port for tape storage, you may want to construct a breakout box so that you won't have to keep swapping cables.

You'll save considerable time and hassle if you build the Sparrow on a printed circuit board. You can copy the circuit board layout or you may purchase a preconstructed circuit board (see parts list). The circuit board holds all the components except the microphone, speaker, and transformer. Switches can be mounted directly on the board, or they can be mounted outside the enclosure (see photo) and attached to the board by short lengths of wire.

Be very careful to solder the following components in their correct orientation: C12, C13, D1, D2, D3, D4, IC1, and IC2. If these components are installed upside down or backwards, they can be destroyed. Orientation of other capacitors and resistors is not critical.

Note that there are four possible positions for the switches S1 and S2 (both up; both down; S1 up, S2 down; S1 down, S2 up). One of these positions puts you in originate mode, another puts you in answer mode, and the remaining two positions cause the pc output to loop around and be fed back into the input. You could use these other two positions for a diagnostic turnaround to test each filter (you'd need to write the software to support this).

You'll get the best operation from the Sparrow if you use a good quality microphone for SPK1, a two-inch speaker for SPK2, and rubber cups for mounting. Specially designed rubber cups provide optimum isolation from ambient noise, thereby preventing stray characters from appearing every time you sneeze or bump the table.

A less expensive procedure is to substitute a two-inch speaker for SPK1 (see schematic) and to make your own mechanical coupling. Two regular-sized soup cans can be used. With a hacksaw, make two "cups" about an inch and a half deep. Drill holes in the bottom of the cups to feed the wires through. Mount each speaker on a thick piece of sponge and place the speakers inside the cups. The more care you take, the better the performance will be. Try to get the speakers to fit flush against the telephone. Don't permit large air gaps or rattling.

The Sparrow Software. The software (see listings 1 and 2) was designed to run on

goto 88

Sparrow assembly instructions

1. Mount speaker and microphone (or two speakers, if you wish to substitute a second speaker for the microphone). What to mount them *on* is your choice; the Sparrow pictured on pages 78 and 79 was built using an ordinary cassette tape tray (see parts list) with holes drilled for the speaker, the microphone, the switches, the power cord, and the cable that connects to the computer. It's best to mount the speaker and microphone within rubber cups (see parts list). Be sure the speaker and microphone are positioned correctly to accommodate the receiver of your telephone.

2. If you're planning to build the Sparrow in an enclosure (such as the one pictured), drill holes for the power cord and computer cable now.

3. If you are using the printed circuit board available from Microgrid (see parts list), you'll find three switches that mount on the board. If you're building the Sparrow in an enclosure, you may want to drill a hole in the side of the enclosure to make the switches accessible.

4. Orient the printed circuit board so that it matches the component layout.

5. Following the component layout, solder the resistors (R1-R24) to the circuit board. Use 60/40 resin core flux solder.

6. Solder the 0.01 uF Mylar capacitors (C1–C4, C6, C7, C10, C11, C14–C17).

7. Solder the 0.1 uF disk capacitors (C5, C8, and C9).

8. Solder the 470 uF electrolytic capacitors; be sure their polarity matches that shown in the component layout.

9. Solder the two zener diodes. Observe polarity.

10. Solder the remaining two diodes. Observe polarity.

11. Connect leads from the circuit board to the speaker and microphone.

12. Connect the power cord to the transformer and then to the circuit board.

13. Connect the computer cable with the DIN connector to the circuit board.

14. Solder the two chips to the circuit board. Save this step for last to reduce the likelihood of damage to the chips.

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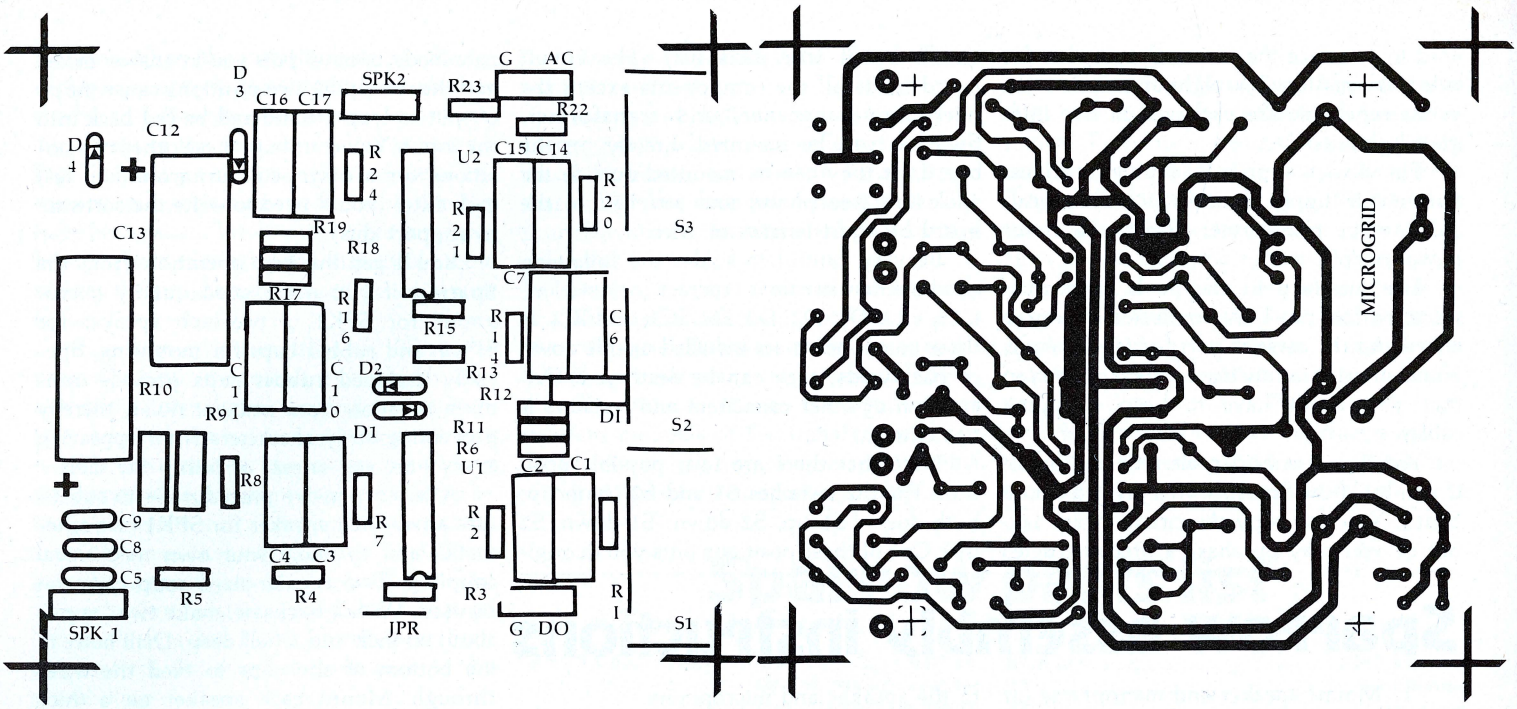
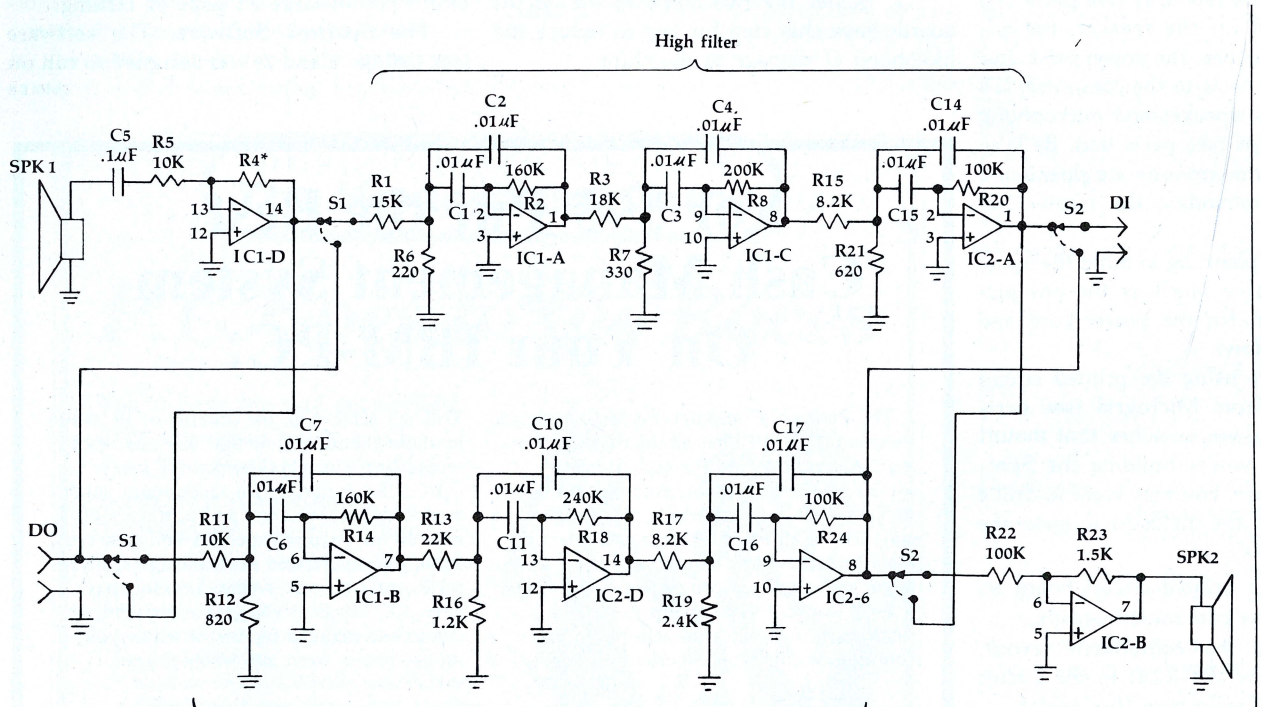


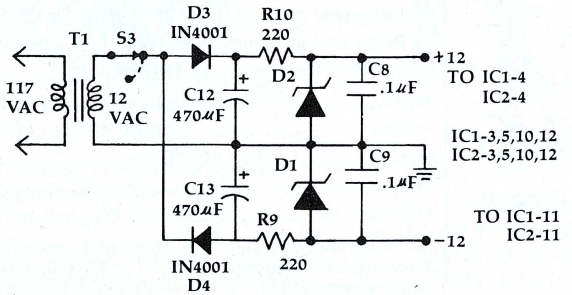
Component layout
shown actual size

Printed circuit layout
shown actual size

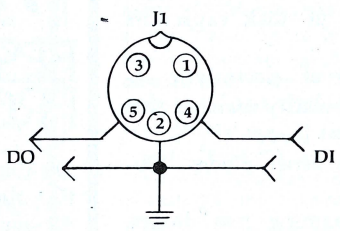
HOLE SIZE
075
056
042
125



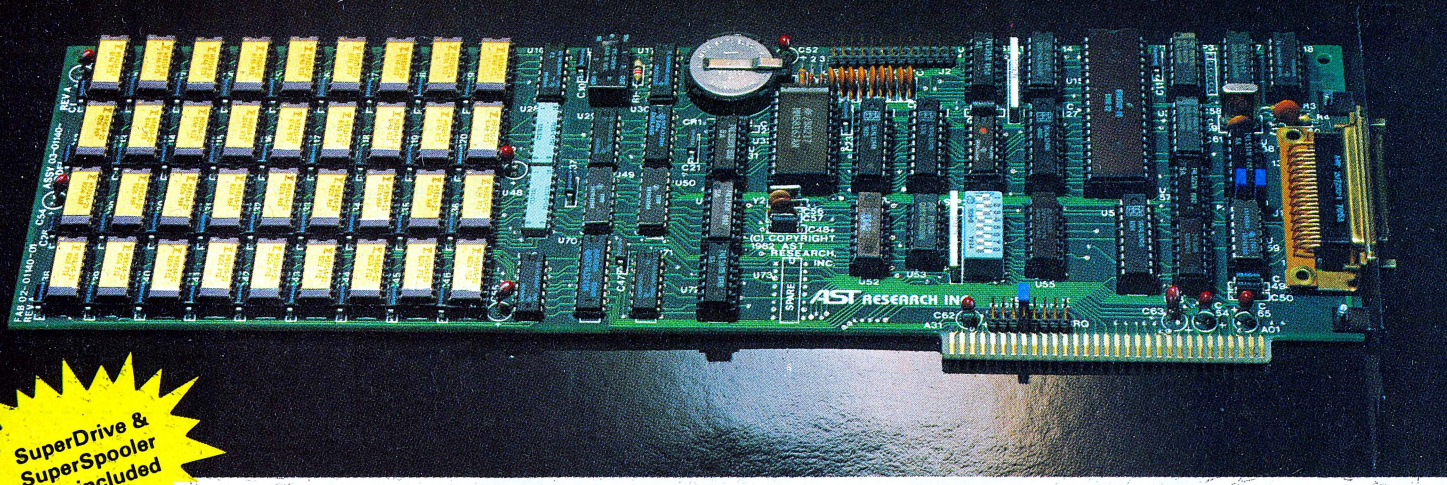
*R4 = 10M IF SPK1 IS A SPEAKER
R4 = 2M IF SPK1 IS A MICROPHONE



Sparrow schematic



ground
resistor
Mylar or disk capacitor
electrolytic capacitor
zener diode
regular diode
integrated circuit
switch
speaker or microphone
transformer



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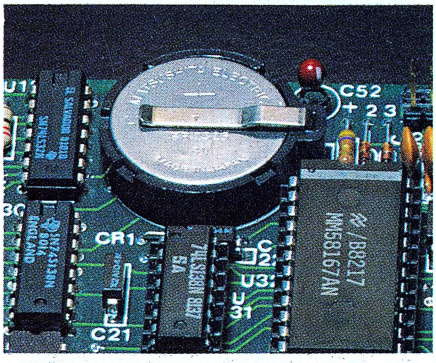

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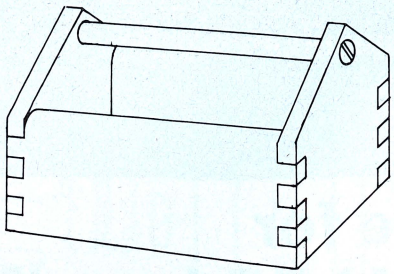

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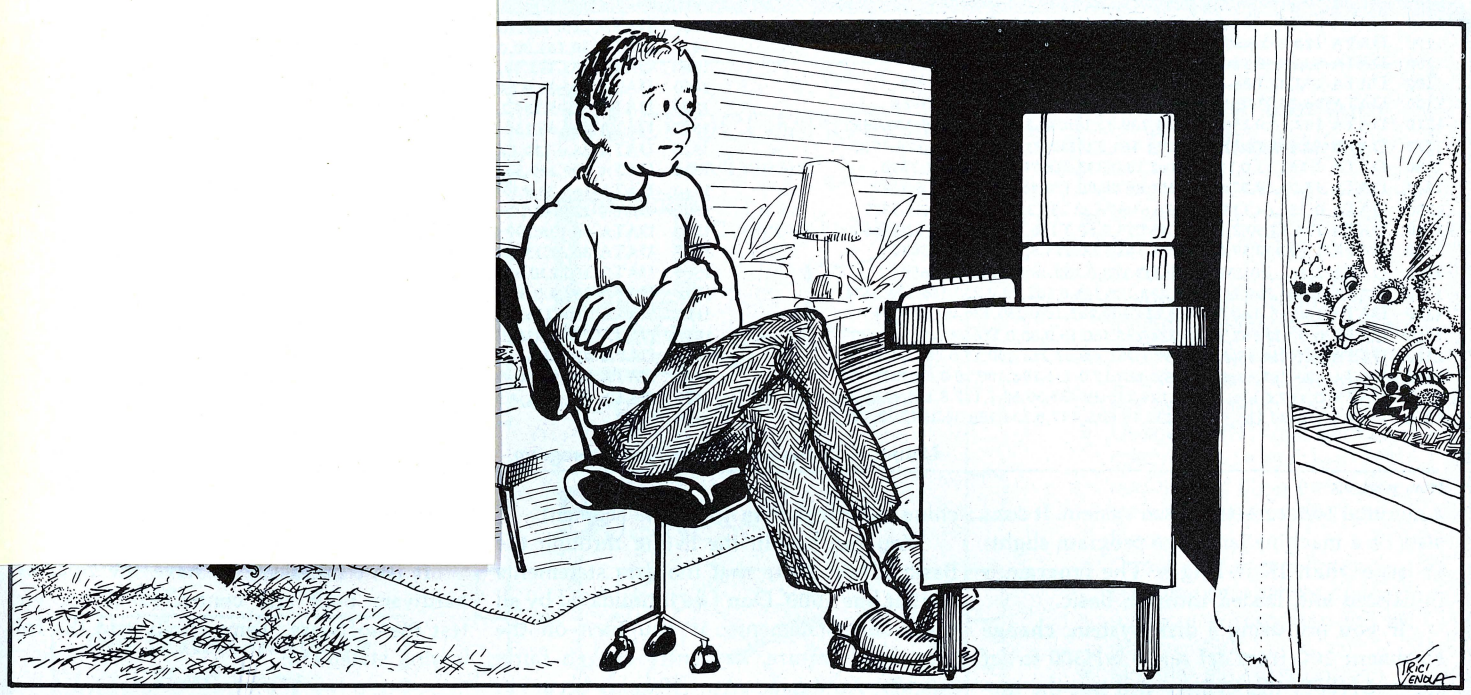
```
10  SCREEN 2: SCREEN 0
20  PRINT "* ************************************************** *"
30  PRINT "*                                                    *"
40  PRINT "*       SPARROW COMMUNICATIONS PACKAGE               *"
50  PRINT "*       REV 1.0 COPYRIGHT 1982 LARRY REAGAN          *"
60  PRINT "*                                                    *"
70  PRINT "* ************************************************** *"
80  OUT 97,68 ' DISABLE CASSETTE
90  '
100   '- - - - - - - - - - - -OPTION VARIABLES- - - - - - - - - - - - - - - - - - - - -
110 OM$="ORIGINATE"    ' OM$ (OPERATION MODE) CAN BE "ANSWER" OR "ORIGINATE"
120 DM$="FULL DUPLEX"  ' DM$ (DISPLAY MODE) CAN BE "FULL DUPLEX" OR "HALF DUPLEX"
130 BAUDR=300          ' BAUDR (BAUD RATE) CAN BE 300, 150, OR 110
140 PAR$="EVEN"        ' PAR$ (PARITY) CAN BE "SPACE","MARK","EVEN", OR "ODD"
150 STB=1              ' STB (STOP BITS) CAN BE 0,1, OR 2
160 '- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
170 '
180 PRINT: PRINT "INITIALIZING . . .": PRINT
190 SUM=0: EL=0: MEMADD=0
200 DEF SEG=&H300 ' SEGMENT ADDRESS OF MACHINE CODE
210 FOR LIN=1000 TO 1640 STEP 10
220 READ CODE: SUM=SUM+CODE: EL=EL+1
230 IF CODE > 255 THEN PRINT "ERROR IN LINE";LIN: GOTO 1650
240 POKE MEMADD,CODE: MEMADD=MEMADD+1
250 IF EL<16 THEN GOTO 220
260 READ CHECK
270 IF SUM+CHECK <> 5000 THEN PRINT "ERROR IN LINE"; LIN
280 EL=0: SUM=0: NEXT LIN
290 IF OM$ = "ORIGINATE" THEN POKE 1032,0: GOTO 320
300 IF OM$ = "ANSWER" THEN POKE 1032,1: GOTO 330
310 PRINT "ILLEGAL OPERATION MODE": GOTO 1650
320 POKE 1024,172: POKE 1025,3: POKE 1026,91: POKE 1027,4: POKE 1028,50:
    POKE 1029,2: GOTO 340
330 POKE 1024,24: POKE 1025,2: POKE 1026,77: POKE 1027,2: POKE 1028,0:
    POKE 1029,4: GOTO 340
340 IF DM$="HALF DUPLEX" THEN POKE 1033,0: GOTO 370
350 IF DM$<>"FULL DUPLEX" THEN PRINT "ILLEGAL DISPLAY MODE": GOTO 1650
360 IF OM$="ORIGINATE" THEN POKE 1033,1: ELSE POKE 1033,2
370 IF BAUDR=300 THEN POKE 1030,101 : POKE 1031,15 : POKE 1060,39 : POKE 1061,17 : GOTO 410
380 IF BAUDR=150 THEN POKE 1030,19 : POKE 1031,31 : POKE 1060,170 : POKE 1061,38 : GOTO 410
390 IF BAUDR=110 THEN POKE 1030,59 : POKE 1031,42 : POKE 1060,247 : POKE 1061,52 : GOTO 410
400 PRINT "ILLEGAL BAUD RATE": GOTO 1650
410 IF PAR$="SPACE" THEN POKE 1034,0: GOTO 460
420 IF PAR$="MARK" THEN POKE 1034,1: GOTO 460
430 IF PAR$="EVEN" THEN POKE 1034,2: GOTO 460
440 IF PAR$="ODD" THEN POKE 1034,3: GOTO 460
450 PRINT "ILLEGAL PARITY MODE": GOTO 1650
460 IF STB>255 THEN PRINT "ILLEGAL STOP BITS": GOTO 1650
470 POKE 1036,STB : POKE 1047,0 : POKE 185, 36
475 POKE 587,144: POKE 588,144: POKE 589,144
480 PRINT " OPTIONS SELECTED:"
490 PRINT " OPERATION MODE=";OM$
500 PRINT " DISPLAY MODE=";DM$
510 PRINT " BAUD RATE=";BAUDR
520 PRINT " PARITY=";PAR$
530 PRINT " STOP BITS=";STB
540 PRINT
550 PRINT "* COMMAND SUMMARY:"
560 PRINT "* CNTRL 6 TO MOVE WINDOW UP"
570 PRINT "* CNTRL - TO MOVE WINDOW DOWN"
580 PRINT "* ALT 128 TO GENERATE BREAK"
590 PRINT "* ALT 129 TO RETURN TO BASIC"
600 PRINT
610 PRINT " POWER ON MODEM, SET SWITCHES"
620 PRINT " FOR ANSWER OR ORIGINATE."
630 PRINT " DIAL UP NETWORK, WAIT FOR"
640 PRINT " CARRIER ( IF ORIGINATE )."
650 PRINT " PLACE RECEIVER ON MODEM."
660 PRINT " HIT RETURN KEY WHEN READY."
670 PRINT
680 INPUT DUMMY$: OFFSET=0: KEY OFF
690 CALL OFFSET: STATUS=PEEK(1038): IF STATUS=0 THEN GOTO 710
700 OUT 97,68     ' TURN OFF CARRIER
710 DEF SEG=0     ' SET TO LOWEST SEGMENT (INTERRUPT AREA)
720 POKE 32,165 : POKE 33,254: POKE 34,0: POKE 35,240 ' RESTORE TIMER VECTOR
730 DEF SEG       ' BACK TO BASIC SEGMENT
740 OUT 67,54: OUT 64,0: OUT 64,0: OUT 33,0: ' INTERRUPT MASK OFF
750 OUT 948,12: OUT 949,0: OUT 948,13: OUT 949,0 ' RESET CRT (MONOCHROME)
760 OUT 980,12: OUT 981,0: OUT 980,13: OUT 981,0 ' RESET CRT (COLOR)
770 KEY ON
780 IF STATUS=0 THEN PRINT "*** RECEIVE CARRIER STILL VALID"
790 IF STATUS=2 THEN PRINT "*** RECEIVE CARRIER GONE - HANG UP"
800 IF STATUS=4 THEN PRINT "*** TIMER MALFUNCTION"
810 IF STATUS=6 THEN PRINT "*** CARRIER GONE, TIMER MALFUNCTION"
1000  DATA 30,176,253,230,33,184,0,0,142,216,184,134,1,163,32,0,3222
1010  DATA 140,200,163,34,0,184,0,4,209,232,209,232,209,232,209,232,2511
1020  DATA 139,216,140,200,3,195,142,216,176,69,230,97,176,182,230,67,2522
1030  DATA 161,0,0,230,66,138,196,230,66,176,0,162,14,0,185,7,3369
1040  DATA 0,180,1,205,16,180,2,186,0,24,187,0,0,205,16,184,3614
1050  DATA 0,0,163,24,0,163,28,0,184,192,3,163,26,0,184,0,3870
```

goto 88

ls Cloud Nine?



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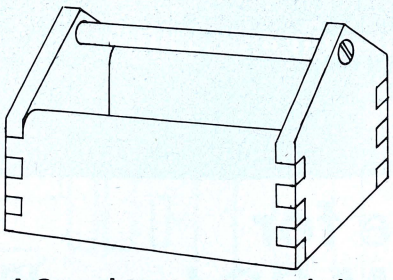

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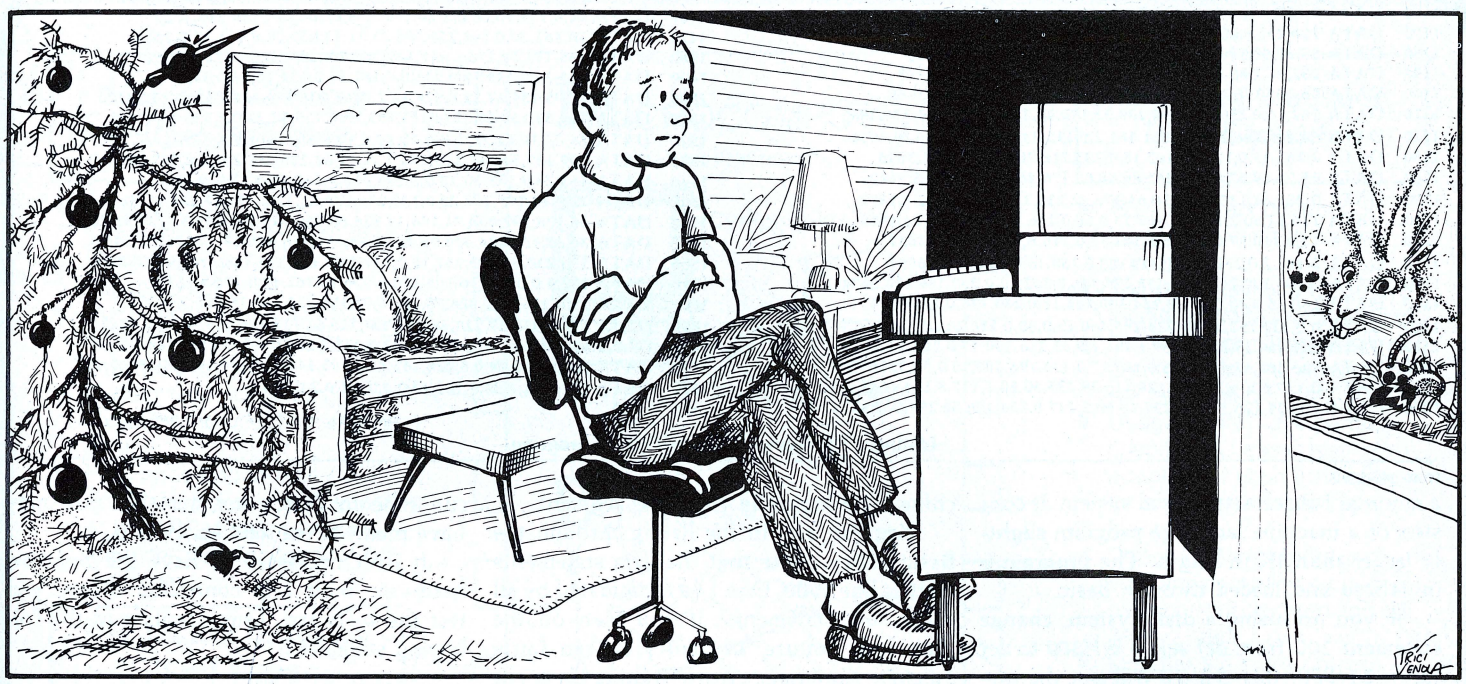
10  SCREEN 2: SCREEN 0
20  PRINT "* **********************************
30  PRINT "*
40  PRINT "*        SPARROW COMMUNICATIO
50  PRINT "*        REV 1.0 COPYRIGHT 1982 LA
60  PRINT "*
70  PRINT "* **********************************
80  OUT 97,68 ' DISABLE CASSETTE
90   '
100   '- - - - - - - - - - - -OPTION VARIA
110 OM$="ORIGINATE"    ' OM$ (OPERATION
120 DM$="FULL DUPLEX"  ' DM$ (DISPLAY MO
130 BAUDR=300          ' BAUDR (BAUD RA
140 PAR$="EVEN"        ' PAR$ (PARITY) CA
150 STB=1              ' STB (STOP BITS) C
160 '- - - - - - - - - - - - - - - - - - -
170 '
180 PRINT: PRINT "INITIALIZING . . .": PRINT
190 SUM=0: EL=0: MEMADD=0
200 DEF SEG=&H300 ' SEGMENT ADDRESS OF
210 FOR LIN=1000 TO 1640 STEP 10
220 READ CODE: SUM=SUM+CODE: EL=EL+1
230 IF CODE > 255 THEN PRINT "ERROR IN LI
240 POKE MEMADD,CODE: MEMADD=MEMAD
250 IF EL<16 THEN GOTO 220
260 READ CHECK
270 IF SUM+CHECK <> 5000 THEN PRINT "ER
280 EL=0: SUM=0: NEXT LIN
290 IF OM$ = "ORIGINATE" THEN POKE 1032,
300 IF OM$ = "ANSWER" THEN POKE 1032,1: C
310 PRINT "ILLEGAL OPERATION MODE": GO
320 POKE 1024,172: POKE 1025,3: POKE 1026,91:
    POKE 1029,2: GOTO 340
330 POKE 1024,24: POKE 1025,2: POKE 1026,77: P
    POKE 1029,4: GOTO 340
340 IF DM$="HALF DUPLEX" THEN POKE 1033,
350 IF DM$<>"FULL DUPLEX" THEN PRINT "ILLEGAL DISPLAY MODE": GOTO 1650
360 IF OM$="ORIGINATE" THEN POKE 1033,1: ELSE POKE 1033,2
370 IF BAUDR=300 THEN POKE 1030,101 : POKE 1031,15 : POKE 1060,39 : POKE 1061,17 : GOTO 410
380 IF BAUDR=150 THEN POKE 1030,19 : POKE 1031,31 : POKE 1060,170 : POKE 1061,38 : GOTO 410
390 IF BAUDR=110 THEN POKE 1030,59 : POKE 1031,42 : POKE 1060,247 : POKE 1061,52 : GOTO 410
400 PRINT "ILLEGAL BAUD RATE": GOTO 1650
410 IF PAR$="SPACE" THEN POKE 1034,0: GOTO 460
420 IF PAR$="MARK" THEN POKE 1034,1: GOTO 460
430 IF PAR$="EVEN" THEN POKE 1034,2: GOTO 460
440 IF PAR$="ODD" THEN POKE 1034,3: GOTO 460
450 PRINT "ILLEGAL PARITY MODE": GOTO 1650
460 IF STB>255 THEN PRINT "ILLEGAL STOP BITS": GOTO 1650
470 POKE 1036,STB : POKE 1047,0 : POKE 185, 36
475 POKE 587,144: POKE 588,144: POKE 589,144
480 PRINT " OPTIONS SELECTED:"
490 PRINT " OPERATION MODE=";OM$
500 PRINT " DISPLAY MODE=";DM$
510 PRINT " BAUD RATE=";BAUDR
520 PRINT " PARITY=";PAR$
530 PRINT " STOP BITS=";STB
540 PRINT
550 PRINT "* COMMAND SUMMARY:"
560 PRINT "* CNTRL 6 TO MOVE WINDOW UP"
570 PRINT "* CNTRL - TO MOVE WINDOW DOWN"
580 PRINT "* ALT 128 TO GENERATE BREAK"
590 PRINT "* ALT 129 TO RETURN TO BASIC"
600 PRINT
610 PRINT " POWER ON MODEM, SET SWITCHES"
620 PRINT " FOR ANSWER OR ORIGINATE."
630 PRINT " DIAL UP NETWORK, WAIT FOR"
640 PRINT " CARRIER ( IF ORIGINATE )."
650 PRINT " PLACE RECEIVER ON MODEM."
660 PRINT " HIT RETURN KEY WHEN READY."
670 PRINT
680 INPUT DUMMY$: OFFSET=0: KEY OFF
690 CALL OFFSET: STATUS=PEEK(1038): IF STATUS=0 THEN GOTO 710
700 OUT 97,68     ' TURN OFF CARRIER
710 DEF SEG=0     ' SET TO LOWEST SEGMENT (INTERRUPT AREA)
720 POKE 32,165 : POKE 33,254: POKE 34,0: POKE 35,240 ' RESTORE TIMER VECTOR
730 DEF SEG       ' BACK TO BASIC SEGMENT
740 OUT 67,54: OUT 64,0: OUT 64,0: OUT 33,0: ' INTERRUPT MASK OFF
750 OUT 948,12: OUT 949,0: OUT 948,13: OUT 949,0 ' RESET CRT (MONOCHROME)
760 OUT 980,12: OUT 981,0: OUT 980,13: OUT 981,0 ' RESET CRT (COLOR)
770 KEY ON
780 IF STATUS=0 THEN PRINT "*** RECEIVE CARRIER STILL VALID"
790 IF STATUS=2 THEN PRINT "*** RECEIVE CARRIER GONE - HANG UP"
800 IF STATUS=4 THEN PRINT "*** TIMER MALFUNCTION"
810 IF STATUS=6 THEN PRINT "*** CARRIER GONE, TIMER MALFUNCTION"
1000  DATA 30,176,253,230,33,184,0,0,142,216,184,134,1,163,32,0,3222
1010  DATA 140,200,163,34,0,184,0,4,209,232,209,232,209,232,209,232,2511
1020  DATA 139,216,140,200,3,195,142,216,176,69,230,97,176,182,230,67,2522
1030  DATA 161,0,0,230,66,138,196,230,66,176,0,162,14,0,185,7,3369
1040  DATA 0,180,1,205,16,180,2,186,0,24,187,0,0,205,16,184,3614
1050  DATA 0,0,163,24,0,163,28,0,184,192,3,163,26,0,184,0,3870
```

goto 88

When Is Cloud Nine?



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```
1060 DATA 184,163,30,0,184,212,3,163,32,0,184,255,31,163,34,0,3362
1070 DATA 180,15,205,16,136,38,22,0,60,2,114,30,80,184,128,7,3783
1080 DATA 163,26,0,88,60,7,117,18,184,0,176,163,30,0,184,255,3529
1090 DATA 7,163,34,0,184,180,3,163,32,0,250,176,255,230,33,176,3114
1100 DATA 48,230,67,176,255,230,64,230,64,232,248,2,251,161,4,0,2738
1110 DATA 43,216,114,36,176,48,230,67,161,6,0,230,64,138,196,230,3045
1120 DATA 64,176,254,230,33,176,0,162,17,0,160,11,0,162,15,0,3540
1130 DATA 176,2,162,13,0,233,149,1,176,253,230,33,180,1,205,22,3164
1140 DATA 116,184,180,0,205,22,162,17,0,60,129,117,3,233,143,1,3428
1150 DATA 60,128,116,123,36,127,122,2,12,128,134,196,160,10,0,60,3586
1160 DATA 0,117,6,134,196,36,127,235,18,60,1,117,6,134,196,12,3605
1170 DATA 128,235,8,60,2,134,196,116,2,52,128,162,17,0,36,127,3597
1180 DATA 80,60,30,116,11,60,31,116,7,160,9,0,60,1,116,3,4140
1190 DATA 232,82,1,88,60,30,116,7,60,31,116,3,233,3,0,233,3705
1200 DATA 88,255,176,1,162,13,0,160,11,0,162,15,0,160,12,0,3785
1210 DATA 162,16,0,250,176,254,230,33,176,48,230,67,161,6,0,230,2961
1220 DATA 64,138,196,230,64,251,161,2,0,232,33,2,233,254,0,176,2964
1230 DATA 3,162,13,0,176,64,162,18,0,235,216,76,82,69,65,71,3588
1240 DATA 65,78,49,57,56,50,251,88,88,88,176,48,230,67,161,6,3442
1250 DATA 0,230,64,138,196,230,64,176,32,230,32,160,13,0,60,3,3372
1260 DATA 116,62,60,2,116,82,160,15,0,60,0,116,29,254,200,162,3566
1270 DATA 15,0,160,17,0,208,216,162,17,0,115,5,161,0,0,235,3689
1280 DATA 3,161,2,0,232,198,1,233,163,0,160,16,0,60,0,116,3655
1290 DATA 7,254,200,162,16,0,235,228,176,0,162,13,0,233,186,254,2874
1300 DATA 160,18,0,60,0,116,8,254,200,162,18,0,233,126,0,161,3484
1310 DATA 0,0,232,152,1,233,224,255,160,15,0,60,0,116,24,254,3274
1320 DATA 200,162,15,0,232,157,1,161,4,0,43,216,160,17,0,208,3424
1330 DATA 216,162,17,0,233,86,0,160,17,0,134,196,160,10,0,60,3549
1340 DATA 0,117,8,134,196,36,128,116,39,235,30,60,1,117,8,134,3641
1350 DATA 196,36,128,117,27,235,18,60,2,117,8,134,196,36,255,122,3313
1360 DATA 15,235,6,134,196,36,255,123,7,176,20,162,17,0,235,3,3380
1370 DATA 160,17,0,250,176,255,230,33,232,42,0,160,9,0,60,2,3374
1380 DATA 116,8,176,0,162,13,0,233,48,254,233,213,254,185,255,255,2595
1390 DATA 226,254,180,4,160,14,0,8,224,162,14,0,233,0,0,176,3345
1400 DATA 253,230,33,31,203,160,17,0,36,127,60,30,117,4,232,207,3260
1410 DATA 0,195,60,31,117,4,232,210,0,195,60,10,117,6,232,149,3382
1420 DATA 0,233,117,0,60,13,117,9,184,0,0,163,24,0,233,104,3743
1430 DATA 0,60,8,117,40,161,24,0,61,0,0,117,24,161,22,0,4205
1440 DATA 139,30,26,0,43,216,137,30,26,0,255,200,163,24,0,232,3479
1450 DATA 153,0,233,68,0,255,200,163,24,0,233,60,0,138,208,161,3104
1460 DATA 24,0,139,30,26,0,3,195,35,6,34,0,209,224,139,216,3720
1470 DATA 30,161,30,0,142,216,136,23,31,139,30,24,0,161,22,0,3855
1480 DATA 255,195,59,216,116,7,137,30,24,0,233,12,0,184,0,0,3532
1490 DATA 163,24,0,232,32,0,233,0,0,161,24,0,139,30,26,0,3936
1500 DATA 1,195,139,22,32,0,176,14,238,66,138,199,238,74,176,15,3277
1510 DATA 238,66,138,195,238,195,161,26,0,139,30,22,0,3,195,163,3191
1520 DATA 26,0,139,14,22,0,139,22,30,0,35,6,34,0,139,216,4178
1530 DATA 209,227,30,142,218,198,7,32,31,64,226,238,232,1,0,195,2950
1540 DATA 161,28,0,139,30,22,0,3,195,235,9,161,28,0,139,30,3820
1550 DATA 22,0,43,195,163,28,0,139,216,139,22,32,0,176,12,238,3575
1560 DATA 66,138,199,238,74,176,13,238,66,138,195,238,195,80,228,98,2620
1570 DATA 36,32,138,224,228,98,36,32,58,196,116,248,88,230,66,138,3036
1580 DATA 196,230,66,195,232,16,0,232,13,0,144,144,144,139,195,80,2974
1590 DATA 232,4,0,88,3,216,195,228,98,36,16,162,19,0,138,38,3527
1600 DATA 19,0,185,85,0,228,98,36,16,58,196,225,248,162,19,0,3425
1610 DATA 176,0,230,67,228,64,138,224,228,64,134,196,139,30,20,0,3062
1620 DATA 43,216,163,20,0,227,4,180,0,235,7,184,0,0,139,216,3366
1630 DATA 180,2,160,14,0,8,224,162,14,0,195,144,144,144,144,144,3321
1640 DATA 172,3,91,4,50,2,101,15,0,0,0,8,1,0,2,0,4551
1650 END
```

Listing 1. Sparrow communications program.

from page 83

a minimal 16K cassette-based system. It consists of a machine language program slightly larger than 1K in length. The program is initialized and loaded through Basic.

If you are using a disk system, change statement 200 from *def seg = &H300* to *def seg = &HB00*; this change will put the machine code higher in the Basic segment.

You can key in the listing through the Basic editor. Note that the *data* statements start at line 1000. Don't be intimidated by all these *data* statements; if you turn on the num lock feature, key entry can go fairly quickly. Automatic error-checking occurs at run time to detect any mistakes you may have made in the *data* statements.

It isn't necessary to have the Sparrow hardware built and connected before you test the software. Temporarily add the following statement:

```
285 POKE 41,71
```

This statement will enable you to hear the transmitted data on the pc's internal speaker. To disable the speaker, delete line 285 before running the program.

Lines 100 through 150 are for setting operational mode, duplex, parity, baud rate, and the number of stop bits. For testing purposes, set the option variables as follows:

```
110 OM$="ORIGINATE"
120 DM$="HALF DUPLEX"
130 BAUDR=300
140 PAR$="EVEN"
150 STB=1
```

Run the program. It takes about twenty-five seconds to initialize; you'll get a message when initialization is complete. Hit the enter key and you'll be executing the Sparrow machine code. Hold down the *A* key and verify that you can display four or five lines of *A*s.

The Sparrow has its own CRT driver program, because the BIOS CRT driver is too slow for the Sparrow. This driver supports both display adapters. Statement 10 forces the CRT adapter into a text mode, rather than a graphics mode. To use a forty-column display, change the first part of statement 10 from *screen 2* to *screen 1* before running the program.

If you're using a graphics adapter you

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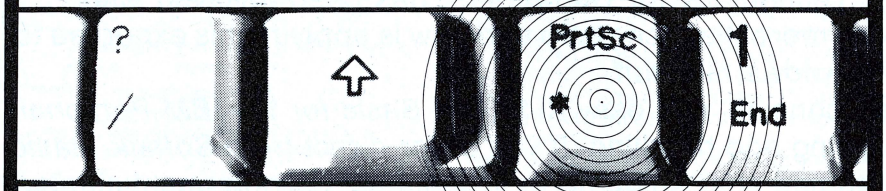

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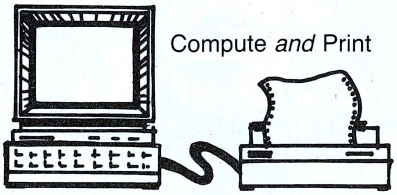

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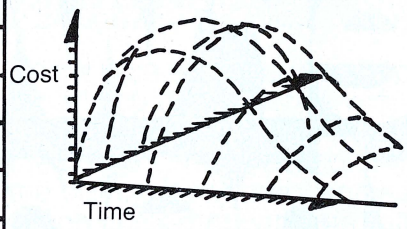

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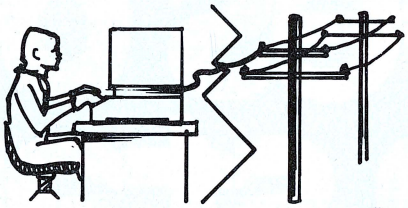

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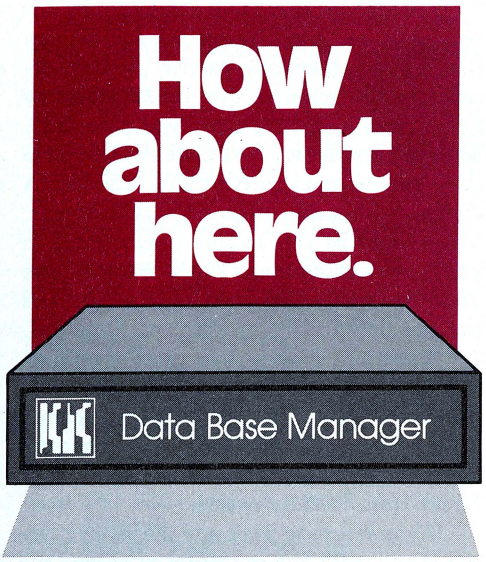

Below is an example of a simple report you can generate with a few keystrokes. By sorting the DAYS OVERDUE column, the billing department knows which customers are late with their payments.

BALANCE OUTSTANDING REPORT

COMPANY	BALANCE	DAYS OVERDUE
ABC Company	23456	82
Jones Company	390	80
York Company	34569	80
GFD Corporation	1000	71
Ace Manufacturing Co.	87990	65
Applied Technologies	4567	61
M and Z Corporation	9000	50
Tyne Industries	7000	45
Advanced Systems	4390	28

NOTE: Send reminders to all accounts overdue 60 days or more

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Program Requirements

IBM Personal Computer with 64K of memory
Two disk drives (DOS 1.0 or 1.1)
Supports all monitors
Supports the following printer lines: IBM PC, Epson, IDS, NEC, Okidata

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can backtrack up to eight pages to see what you did earlier in a work session. By hitting control-6 or control-hyphen you can move your display window up or down. It's a good idea to keep the cursor on the bottom line of the display to prevent confusion when page 7 wraps around to page 0.

By typing *alt 128* (on the number pad) you can generate a *space* frequency for half a second. Some systems use this half-second *space* tone as a signal to *break* into a transmission. Typing *alt 129* (again on the number pad) returns you to Basic, restores the pc machine state, and gives you the Sparrow status.

When you're satisfied that the software is running correctly, plug the hardware into your pc. Delete line 285. Run the software in originate mode with switches S1 and S2 both in the originate configuration. You should hear the 1,270 Hz carrier tone in the Sparrow speaker. If you whistle or clap your hands, you should receive trash on the screen. Depressing keys should cause the Sparrow to chirp.

Reconfigure the hardware and software for answer operation and verify that you hear a 2,225 Hz tone and can receive trash. The design is fairly foolproof. If the Sparrow generates tones in both originate and answer modes, you're in good shape.

When you're confident that the hardware-software combination is working okay, configure the system for originate, full duplex, 300 baud, space parity, and one stop bit. Run the program and dial up the Johnson City, New York BBS, at (607) 797-6416.

The bulletin board will automatically answer your call and generate a 2,225 Hz carrier. When you hear the carrier, place the receiver on the Sparrow; then hit the enter key a few times to get the attention of the BBS. The system will say "TYPE HELP OR SJBBS . . ." You respond *othersys* and hit enter. A directory of many other BBSs will appear. You should be able to find one or more in your own calling area. You'll want to give your Sparrow a thorough workout, and practice time will be cheaper on a local call.

Watch for systems that cater specifically to the IBM pc. There is an IBM pc BBS at (703) 560-0979. This system requires *even* parity. When this BBS asks if you are a pc, tell it *no* (Sparrow software is slightly different from IBM software).

If you return to Basic and the receive carrier is still valid, the pc continues to send the transmit carrier so that the link is maintained. This enables you to use the pc for other purposes, such as storing a program to disk. You can pick up where you left off by recalling the machine language program. To do that, enter a *def seg* statement with the same hex number as you used in statement 200, type *offset=0*, then type *call offset*.

If the receive carrier is gone when you return to Basic, the pc turns off its transmit carrier, restores the interrupt vectors, and instructs you to hang up the phone.

Building Your Software Library. If you've ever keyed in a long program listing from a magazine or book, you know how tedious and error-prone the process can be. Many of the BBS systems have public domain Basic programs stored as files. It is possible to use the Sparrow to get these programs into your computer.

You can trick the Basic editor inside the pc into thinking you have keyed a program when you have actually downloaded it from a remote system. If you have a color/graphics adapter, the statements in listing 2 can be added to the Sparrow program. Use the color/graphics board in an eighty-column text mode. The board has enough memory to hold four screens (or *pages*) of text. Page 0 will be used as a "command" page, and pages 1 through 3 will be used to store three pages of text (slightly more than seventy-five lines).

Just before commanding the BBS to list a Basic program, type *alt 129* to get back to pc Basic. Type *run 2000* and you will have reinitialized the CRT pointers. Hit enter and you will be back on line to the BBS. Now command the BBS to list the program. The characters you type to do this will be placed at the end of the "command" page. The program listing will be placed sequentially in the CRT buffer, starting at the beginning of page 1.

When the listing is complete or the CRT buffer is full, type *alt 129* to return to Basic. Type *run 3000* and hit enter. The CRT buffer will be stored as four files with twenty text lines per file (if you have a cassette system you'll have to shut down the Sparrow in order to switch over to cassette operation).

To process the text, load the text files back to CRT page 0 one file at a time. To do this, position the cursor at the bottom of the screen and type *def seg = &HB800*. This will point Basic to the start of your CRT buffer. Now type the following command:

BLOAD "PART1", 160

This causes the first twenty lines of text to be loaded on the screen. Send the cursor to the upper-left corner of the screen, hit the enter key twenty times, and you will have entered the first twenty lines of the program. Now type the following:

BLOAD "PART2", 160

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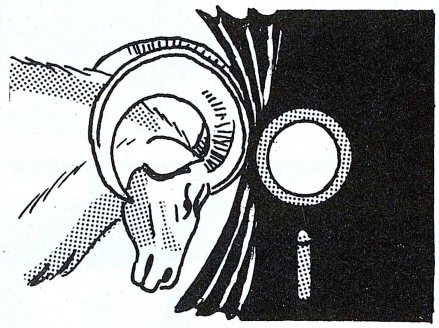

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The next twenty lines of text will be loaded on the screen. Repeat the procedure you used for the first twenty lines; do the same with the other two files, until you've entered the entire program with the Basic editor. If the listing you desire is longer than seventy-five lines, you'll have to take in the program seventy-five lines at a time, but you can still get the whole program.

Conclusions. The Sparrow can be as reliable or more reliable than standard acoustic modem systems. Since there is less hardware, there is less to break down. The technique used by the Sparrow to demodulate is conceptually the same as that used by LSI modem chips, such as the MC6860 or the MC14412. The system can be fine tuned with software updates. Ridiculously complicated modulation and demodulation algorithms could be used to squeeze out every bit of performance conceivable, but you should find that the program listed here serves your needs adequately.

The Sparrow offers simplicity and low cost while maintaining compatibility with Bell 103. In spite of incompatibilities with most available communications software, the Sparrow offers a very inexpensive alternative to spending three or four hundred dollars for communications capability. Once you start working with remote systems you'll be surprised to find out how much information is only a phone call away. ▲

Add statements 2000–2020 to the Sparrow communications program to clear the CRT memory and reset the screen pointers. Run at 3100 instead of at 3000 when you are saving the second group of 75 lines from a long listing. If the listing is longer than 150 lines, add a similar program starting at statement 3200, but label files as Part9–Part12.

```
2000 FOR I=3 TO 0 STEP-1:SCREEN 0,I,I:
     NEXT I
2010 DEF SEG=&H300 ' THIS STATEMENT
     MUST MATCH STATEMENT 200
2020 GOTO 660
```

Statements 3000–3060 store pages 1–3 of CRT memory to disk or cassette. Four text files called Part1–Part4 are created.

```
3000 DEF SEG=&HB800 'POINT TO CRT
     BUFFER
3010 BSAVE "PART1",4000,3200
3020 BSAVE "PART2",7200,3200
3030 BSAVE "PART3",10400,3200
3040 BSAVE "PART4",13600,3200
3050 PRINT "PART1-PART4 SAVED"
3060 END
```

Statements 3100–3160 are identical to 3000–3060 except the files are named Part5–Part 8.

```
3100 DEF SEG=&HB800 'POINT TO CRT
     BUFFER
3110 BSAVE "PART5",4000,3200
3120 BSAVE "PART6",7200,3200
3130 BSAVE "PART7",10400,3200
3140 BSAVE "PART8",13600,3200
3150 PRINT "PART5-PART8 SAVED"
3160 END
```

Listing 2.
Transferring files with the Color/Graphics Adapter

Sparrow trouble-shooting guide.

Symptom	Possible cause
Can't return to Basic	Don't type control-scroll-lock (the standard break for Basic programs) while you are executing the Sparrow machine code. If you do try to break this way, the CRT screen will not reset when you finally do return to Basic. Remember that when you type *alt 129* the numbers must be typed from the numeric keypad.
Keys aren't displayed	Recall that if you are in full duplex mode, keys don't get displayed. Only information received from the communications link gets displayed.
No Sparrow sounds	Double-check wiring. Verify component placement on the circuit board. Check switch settings. Verify that IC1 and IC2 have +12 volts on pin 4 and −12 volts on pin 11. The most likely causes of problems will be solder shorts or solder bridges, misplaced components, or components installed backwards.
No data received	If the Sparrow generates tones for both answer and originate, but trash is not received when you make noises, check SPK1 and its connections.
Can't log on	Make sure that the telephone mouthpiece is mounted on SPK2 and that the telephone earpiece is mounted on SPK1 (sounds from the phone go to SPK1; sounds to the phone come from SPK2).
Lots of parity errors	Check to be sure you initialized for the correct parity and baud rate.
Double characters	If you are initialized for half duplex when the remote system is operating full duplex, you will see two characters displayed for each one you type.
Cursor gets lost	If the Sparrow receives a control-6 or a control-hyphen, the display window moves, which causes the cursor to be displaced. You can find it again by typing control-6 or control-hyphen.
Excessive errors at 300 Baud	The values stored at addresses 1061 and 1060 are for coarse and fine tuning, respectively. Experiment by poking different values at these locations (line 370).

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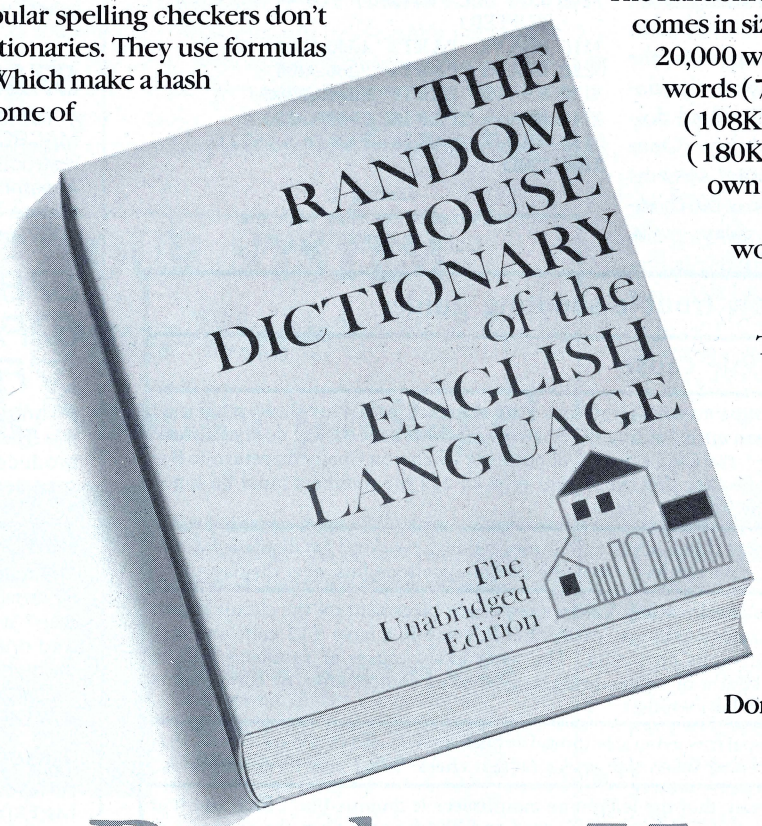

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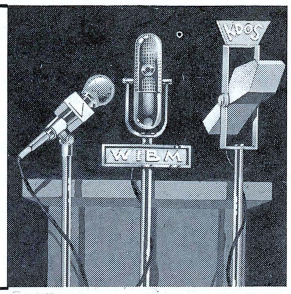

Unless otherwise indicated, software listed runs in DOS on machines with either display adapter and requires 64K and at least one disk drive.

Δ **The Zork Users Group** (Box 20923, Milwaukee, WI 53220) offers a line of accessories for Infocom's adventures: *InvisiClues*, a series of booklets with clues for the *Zork* adventures and *Starcross* that do not appear until wiped with a special pen. $9.95. Δ Maps for the adventures, with the visible items marked in each location. $2.95. Δ A full-color, 22 x 28-inch *Zork I* poster. $5.95. Δ Souvenir buttons saying "Master Adventurer," "Hello, Sailor," "Zorkers Do It under the Rug," "I Am a Zork Groupie," "I'd Rather Be Zorking," and "I Love Zork." $1.25 each, or six for $6.

Δ **Accountants Microsystems** (1404-140th Place N.E., Bellevue, WA 98007; 206-643-2050) has released its accounting package on a 12M Davong hard disk. The AMI system is designed for corporate-level accounting. It includes three levels of report writing and modules that adapt it to a variety of businesses. $3,495.

Δ **Microsoft** (10700 Northup Way, Bellevue, WA 98004; 206-828-8080) has released *Flight Simulator*, a color program developed by SubLogic. *Flight Simulator* provides a cockpit-eye view of the world, including Chicago, Los Angeles, Seattle, New York, and Boston, each with its own regional characteristics. There is also a "British Ace" combat game and an "Air Traffic Controller" system. Requires color/graphics adapter. $49.95.

Δ **Olive Branch Software** (1715 Olive Street, Santa Barbara, CA 93101; 805-962-4682) has announced the release of *Soflok*, a copy-protection program. *Soflok* copies a disk in a form that runs normally, but cannot be copied. It leaves space on the disk so DOS can be added later. There is no royalty, but use is restricted to protecting one program only. Requires 32K and two drives. $150.

Δ **Cavri Systems** (26 Trumbull Street, New Haven, CT 06511; 203-562-4979) has released a video controller for storage and retrieval of audio-visual information. The controller permits a user to write, edit, and view sales presentations or computer instruction programs. It can control a variety of industrial videotape or videodisc players. Requires RS-232 port. $1,900.

Δ **Computer Distributors** (2603 West Twenty-second Street, Suite 24, Oak Brook, IL 60521; 312-325-2430) is preparing a line of terminal emulators for the Personal Computer. The first program, called *TES-1*, emulates the Texas Instruments 763 bubble memory terminal. Using *TES-1*, it is possible to replace a TI 763 terminal without any change in host software. Runs under concurrent CP/M-86 (license included). $795.

Δ **Kraft Systems** (450 W. California, Vista, CA 92083; 714-724-7146) offers a joystick with a limited one-year warranty. $69.95. Δ Also: a pair of game paddles with limited warranty. $49.95.

Δ **Hayden Book Company** (50 Essex Street, Rochelle Park, NJ 07662; 201-843-0550) has published *The 8086/8088 Primer*, an introduction to the 8086 microprocessor. It describes the 8086 architecture, shows how to design a system incorporating an 8086, and discusses how to write programs that run on the 8086. The book is written by Stephen P. Morse, designer of the 8086 microprocessor. $10.95. Δ Meanwhile, Hayden has announced a new discount policy. Dealer discounts will run 40 percent on a minimum $100 order, reaching a maximum of 50 percent. There is also a 3 percent discount on prepaid or COD orders. Dealer credit limits are being increased and a new order processing system is being installed to reduce order turnaround time.

Δ **Microstuf** (1900 Leland Drive, Suite 12, Marietta, GA 30067; 404-952-0267) offers *Transporter*, a new communications program compatible with the older *Crosstalk*. *Transporter* can make phone calls and send and receive files without operator assistance, thus taking advantage of night phone rates. Requires modem and two drives. $295.

Δ **Starware** (1701 K Street, N.W., Washington, DC 20006; 202-466-7351) has published a revised edition of Tenley Design's *Inside the IBM Personal Computer*. Intended to supplement the technical reference manual, it contains information on such matters as motherboard electronics, I/O through expansion slots, and addressing. $12.95.

Δ **Frontier Technologies** (Box 11238, Milwaukee, WI 53211; 414-964-8689) has announced a new line of products, including a series of expansion boards: 64K ($345), 128K ($595), 192K ($795), and

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Δ **Lifetree Software** (177 Webster Street, Suite 342, Monterey, CA 93940; 408-659-3221) has released version 1.2 of its word processor *Volkswriter*. The program is no longer copy protected. It has enhanced formatting, including headers, footers, subscripts, superscripts, microjustification, proportional spacing, and conditional page breaks. It can store formats and lay out documents according to type. It can support most printers without requiring control codes, and it can use all 256 characters. Version 1.2 is available for $20 to registered owners. It is free to anyone who purchased an older version after September 1. Also, a 128K version, which integrates all overlays, is available free to registered owners.

Δ **Computer Systems Research** (195 West Main Street, Box 45, Avon, CT 06001; 203-678-1212) offers "The IBM Personal Computer Primer Series," a computer-aided instruction package. It has courses on "Major System Components," "Using the Keyboard of the IBM Personal Computer," "Basic Computer Concepts," "Using the Basic Computer Language," "The Disk Operating System," and "Problem Determination." In addition to the programs, there is a 143-page workbook. $150.

Δ **TexaSoft** (1028 North Madison Avenue, Dallas, TX 75208; 214-946-7912) sells the *VersaText* word processing and database system. *VersaText* can keep inventories, produce mail labels, or create form letters. Requires two drives. $149. Δ Other products: *The Thinker*, a spreadsheet program. $49. Δ *Trilogy*, an adventure based on the works of Tolkien. $35. Δ *The Queen of Hearts*, a maze game playable with keyboard or joystick, and monochrome adapter or color. $35. Δ *Set the Hostages Free*, an action game with multiple levels of difficulty. $35.

Δ **Whitney Educational Services** (1777 Borel Place, Suite 402, San Mateo, CA 94402; 415-341-5818) has announced a video interface for the Personal Computer. The videotape/videodisc controller costs $990. Δ Whitney also sells *Insight PC*, a program that allows nonspecialists to write interactive video instruction. It accepts input in the form of English sentences, then creates a program to execute the instructions. $990.

Δ **James Electronics** (4050 North Rockwell Street, Chicago, IL 60618; 312-463-6500) produces a 250 watt isolator that reduces the danger of power spikes. $265.

Δ **Technical Analysis** (120 West Wieuca Road N.E., Atlanta, GA 30042; 404-252-1045) sells an interface for the IBM 3270 controller. It emulates a 3278 display, enabling interaction with a host computer. $1,195.

Δ **Individual Software** (24 Spinnaker Place, Redwood City, CA 94065; 415-591-4166) has lowered the price of *The Instructor* program for the Personal Computer. *The Instructor* teaches such fundamentals as keyboard use and system commands. The new price is $39.95.

Δ **Microbase Software** (Box 40353, Indianapolis, IN 46240; 317-877-4304) is the creator of the *Microbase Software Generator*, a program that allows the user to create database and report programs in Basic by printing the desired file or report to the screen and then answering a set of questions. 96K, eighty-column screen, two drives, and printer recommended. $350 for user version, $495 for system developer version. ▲

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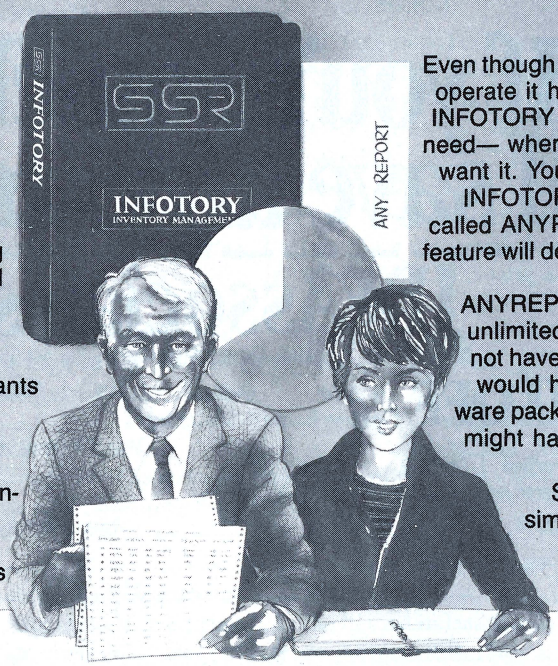

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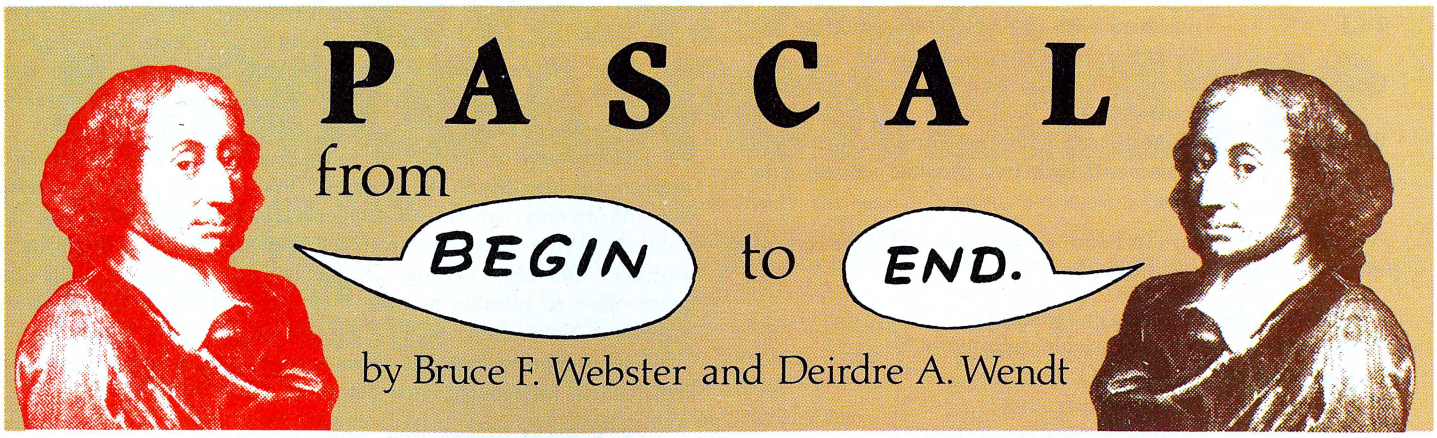

In our last exciting installment, we took the following simple Basic program:

```
100  REM SIMPLE BASIC PROGRAM
110  INPUT A
120  INPUT B
130  C = A + B
140  PRINT C
150  STOP
160  REM END OF SIMPLE BASIC PROGRAM
```

and, in eight short steps, converted it into the following simple Pascal program:

```
PROGRAM simple(input,output); (* ignore "(input,output)" *)
(* A simple Pascal program converted from Basic.
   DATE:      23 December 1982
   AUTHOR:    Charles Q. Fordyce                    *)
VAR
   a,b        : integer;     (* input variables *)
   c          : integer;     (* output variable *)
BEGIN      (* main body of PROGRAM simple *)
   readln(a); readln(b);
   c : = a + b;
   writeln(c);
END. (* of PROGRAM simple *)
```

thus proving that anyone who can write a simple Basic program can write a simple Pascal program. You may wonder how important that really is, but in a world full of uncertainties it's nice to establish something.

Now if that's as far as you want to go in learning Pascal, if Basic meets all your other needs, then fine—turn the page and go read another article. Just remember the conversation between the Scotsman and the Englishman, to wit:

Englishman: "I was born as an Englishman, I live as an Englishman, and I will die as an Englishman!"
Scotsman: "Have ye no ambition?"

If, on the other hand, you really want to show that programmer (who is forever flaunting her or his Pascal programs at you) that you are not as benighted as she or he thinks, then stick around. We'll have you saying "overlapping subranges of an enumerated data type" in just a few minutes.

Which brings us to this month's topic: variables. Variables, as you know, are like little named pigeonholes that we use in our programs to store values. In the Pascal example shown, *a*, *b*, and *c* are integer variables. That is, we can assign a single integer value to each one of those three names. Then, when we reference the name, we can get the value back. Let's see how Pascal handles variables.

Naming Names. One major difference between Pascal and, say, Basic or Fortran is that each and every variable in a Pascal program must be declared before it can be used. To declare a variable, you specify two things: its name and its data type (more on data types shortly). All variables used in a program have to be declared in a special section at the start of the program:

```
PROGRAM programname;
VAR
(* all variables declared here *)
BEGIN
(* main body of program here *)
END.
```

All that standard Pascal requires of a variable name is that it begin with a letter (a to z, upper or lower case) and be followed by zero or more letters or digits (0 to 9). Maximum length and the allowability of additional characters depend on the Pascal you're using; for example, both UCSD Pascal and IBM Pascal permit very long identifiers (although UCSD only recognizes the first eight characters and IBM only recognizes the first thirty-one), and both these Pascals allow the use of the underscore character. So in UCSD and IBM Pascal the following are all legal variable names:

```
this_is_a_test          fred          a3245ibd32dc
year_of_the_cat         antidisestablishmentarianism
```

Typing Types. Pascal not only demands that you list the names of all the variables you plan to use, but it also requires that you specify each variable's *type*. Each declaration statement has the following format:

```
(* one or more names *)     :     (* data type *);
```

As mentioned in last month's column, Pascal has four standard data types: *integer*, *real*, *char*, and *boolean*. Here are some loose definitions:

Integer	numbers without decimal points, such as 3, 0, 553, −26412
Real	numbers with decimal points, such as 0.0, 53.421, −3.1415927, 1.86272e05
Char	single ASCII characters, such as b, *, 0, control-C
Boolean	an enumerated data type (more about these in a moment) with two possible values; true or false

With this information in hand, we can now write the following useless but enlightening program:

```
PROGRAM useless_but_enlightening;
(* purpose: to illustrate variable definitions *)
(* Written by:     Chester Q. Fordyce      *)
(* Date:           1 November, 1982        *)
VAR (* start of variable declaration section *)
  month, day, year            : integer;
  pi, radius, circumference   : real;
  first_initial, last_initial : char;
  to_be, not_to_be            : boolean;
BEGIN (* start of main body of program *)
  month := 10;  day := 1;  year := 1982;
  radius := 52.137;
  circumference := 6.28318 * radius;
  first_initial := 'W';
  last_initial := 'H';
  to_be := true;   not_to_be := false;
END. (* of PROGRAM useless_but_enlightening *)
```

You'll recall from our discussion last month that you must use a colon and equal sign (:=) together when assigning variables. A simple equal sign will not do the job in Pascal. Also notice that values assigned to *char* variables have to be surrounded with single quote marks (apostrophes).

Defining Your Own. One of the marvelous features of Pascal is the ability it gives you to define your own data types. This is a vast subject, which we'll chip away at from time to time. Our chip for this month is *enumerated* data types (also known as *scalar* data types). For typographic purposes, we will abbreviate enumerated data type as *EDT*.

The purpose of an EDT is to replace meaningless values with meaningful identifiers. An example? Well, in the program *Useless but Enlightening*, we set an integer variable named *month* to the value 10. What does this mean? Most of us, after a little thought, will say, "October." Wrong! Chester Q. Fordyce, author of the program, likes to number months 0 through 11, so in this program 10 means November.

The ambiguity brought about by using numbers to represent months can be avoided. Just define an EDT, as follows:

```
PROGRAM useless_but_enlightening;
TYPE (* note that EDTs are declared before variables *)
  months   : (january,february,march,april,may,june,july,
              august,september,october,november,
              december);
VAR
  month    :  months;
BEGIN
  month := november;
END.
```

Now there is no doubt at all about what value the variable *month* holds. Judicious use of EDTs can aid program development in three ways. First, by increasing program clarity. The statement *month := november* is better understood than *month := 10*. Second, by reducing valid-but-incorrect typos. For example, it's harder accidentally to type *december* for *november* than it is to type *11* when you mean to type *10*. And third, by limiting the range of values a vari-

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able may hold. As a variable of type *integer*, *month* can have any of thousands of values, most of them absurd; as a variable of type *months*, *month* can only be assigned one of the twelve values you've declared to be within type *months*.

Here's another sample program demonstrating the use of EDTs:

```
PROGRAM another_sample_program;
TYPE
  days_of_the_week  : (mon,tues,wed,thur,fri,sat,sun);
  drive_status      : (not_moving,impulse,
                       warp_engines);
  Lucas_films       : (THX1138,American_Graffiti,
                       Star_Wars,Empire_Strikes_Back,
                       Revenge_of_the_Jedi,
                       Raiders_of_the_Lost_Ark);
  the_old_gang      : (Wayne, Nancy,Eric,Alan,Dixie,
                       John,Tom,the_rest);
VAR
  today             : days_of_the_week;
  engines           : drive_status;
  flick_for_the_day : Lucas_films;
  companion         : the_old_gang;
BEGIN
  today := fri;
  engines := impulse;
  companion := Wayne;
END.
```

Given a variable of some EDT, there are a few things that you might want to do with it or know about it. For example, you might want to set *month* to its next value. If you had declared variable *month* to be of type *integer*, the way you would increment its value would be to set *month := month + 1*. That approach won't work if *month* is of type *months*. Instead, Pascal provides two special operations, called *succ* and *pred*.

Succ returns the value following a given EDT value, while *pred* returns the value preceding it. For example, *succ(november)* returns *december*, and *pred(Star_Wars)* returns *American_Graffiti*.

So, instead of writing

```
month := month + 1;
```

you can write

```
month := succ(month);
```

Succ and *pred* work with *integer* and *char* variables as well as with EDTs, so you could use the statement *month := succ(month)*; regardless of whether *month* is of type *integer* or of type *months*.

Another function that can be used with EDTs is *ord*. *Ord* returns the ordinal value of an EDT. For example, the values *mon, tues, wed, . . . sat, sun* have the ordinal values *0, 1, 2, . . . 5, 6*, respectively. And, as it turns out, Fordyce wasn't so dumb after all; if the EDT *months* is defined as we defined it a moment ago, then *ord(november)* is indeed *10*.

Subranges. There are times when you want a variable to have only a subset of the values normally associated with its data type. For example, if we really wanted to make *month* a variable of type *integer*, we would want some way of ensuring that *month* didn't get assigned to any values outside the range of 1 to 12 (or, if you think the way Fordyce does, 0 to 11). Pascal offers a way of keeping values in bounds. Instead of saying

```
VAR
  month : integer;
```

you may say

```
VAR
  month : 1..12;
```

Having declared the variable in this fashion, if you then tried to compile a program that included the statement *month := 13*, you would get an error. If you tried to run a program where some bug caused *month* to have a value outside the range of 1 through 12, you would get an error. This is a marvelous way of catching those insidious little bugs that are so hard to find.

You can also declare subranges of EDTs, to wit:

```
TYPE
  month_range  =  1..12;
  Lucas_films  =  (THX1138,American_Graffiti,Star_
                   Wars,Empire_Strikes_Back,Revenge_
                   of_the_Jedi,Raiders_of_the_Lost_
                   Ark);
  second_set   =  Star_Wars..Revenge_of_the_Jedi;
  latest_films =  Revenge_of_the_Jedi..
                  Raiders_of_the_Lost_Ark;
VAR
  month        :  month_range;
  SW_flick     :  second_set;
  new_flick    :  latest_films;
```

As you can see, both *second_set* and *latest_films* are subranges of *Lucas_films*. Not only that, but both subranges contain the value *Revenge_of_the_Jedi*. This means that they are *overlapping subranges of an enumerated data type*—which is your buzz phrase for the month.

Constancy amid Change. Sometimes your program will need to use values that don't change. Such values are called *constants*. In one of the sample programs seen earlier in this month's column, we had the statement

```
circumference := 6.28318 * radius;
```

Someone reading this statement might wonder just where 6.28318

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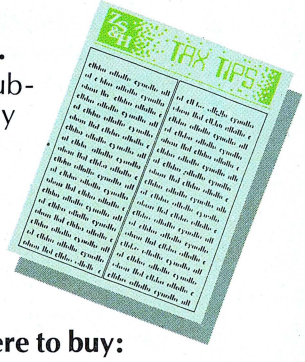

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came from. They'd probably find it easier to understand

```
circumference := two_pi * radius;
```

We could simply declare *two_pi* as type *real* and set the variable to its appropriate value (6.28318) somewhere in the program. But Pascal offers us a more elegant solution: we can declare this value as a constant.

All constant declarations are placed immediately after the *Program* statement and before the *Type* section:

```
PROGRAM sample;
CONST
  (* all constant declarations *)
TYPE
  (* all data type definitions *)

BEGIN
  (* main body of program *)
END.
```

A constant declaration uses the form

```
(* constant identifier *) = (* value *);
```

where *value* is a constant value of one of the four basic data types—integer, real, char, and boolean. For example:

```
CONST
  two_pi      =  6.28318;
  year        =  1983;
  grade       =  'B';
  forever     =  false;
```

Note well that these are constant values—*not* variables. You will get an error during compilation if you include a statement such as *year := 5*, since *year* has not been defined as a variable.

One of the best uses for constants is to define limits or key values that might change with different versions of your program. For example, let's suppose that we're developing a graphics program for the IBM pc and that our first version uses black and white graphics only. We might do the following:

```
PROGRAM graphics_utility;
CONST
  xmin        =    0;
  xmax        =  640;
  ymin        =    0;
  ymax        =  200;
TYPE
  xrange      =  xmin..xmax;
  yrange      =  ymin..ymax;
VAR
  x1,x2       :  xrange;
  y1,y2       :  yrange;
BEGIN
  (* program *);
END.
```

Then in our program we could always refer to our constant values for limits. For example, we would say

```
FOR x1 := xmin TO xmax DO
```

instead of

```
FOR x1 := 0 TO 640 DO
```

Once we got this version working, we might decide to adapt it to color graphics. By changing the value of *xmax* from 640 to 320—by changing just one statement—the entire program could be automatically adjusted to the different coordinate range. On the other hand, if we had used the value (640) throughout the program, instead of the constant (*xmax*), we would have to find and alter each place where we had used it.

That's it for this month. Next time we'll get into some programs that are a little more useful than the ones we've seen so far. ▲

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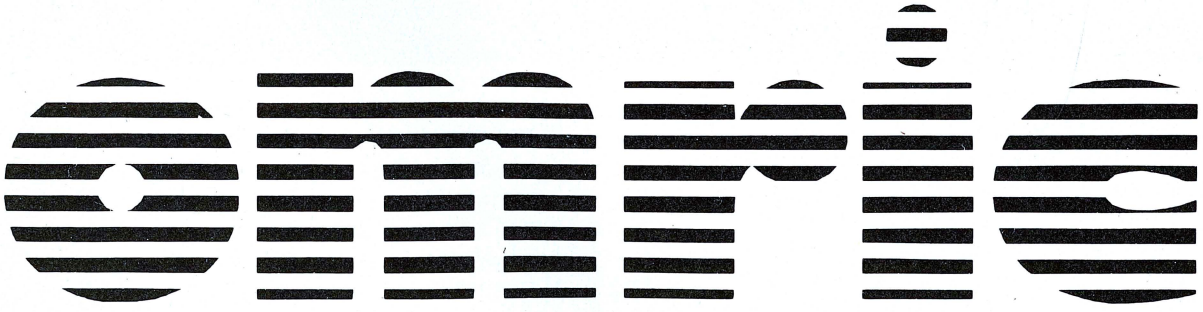

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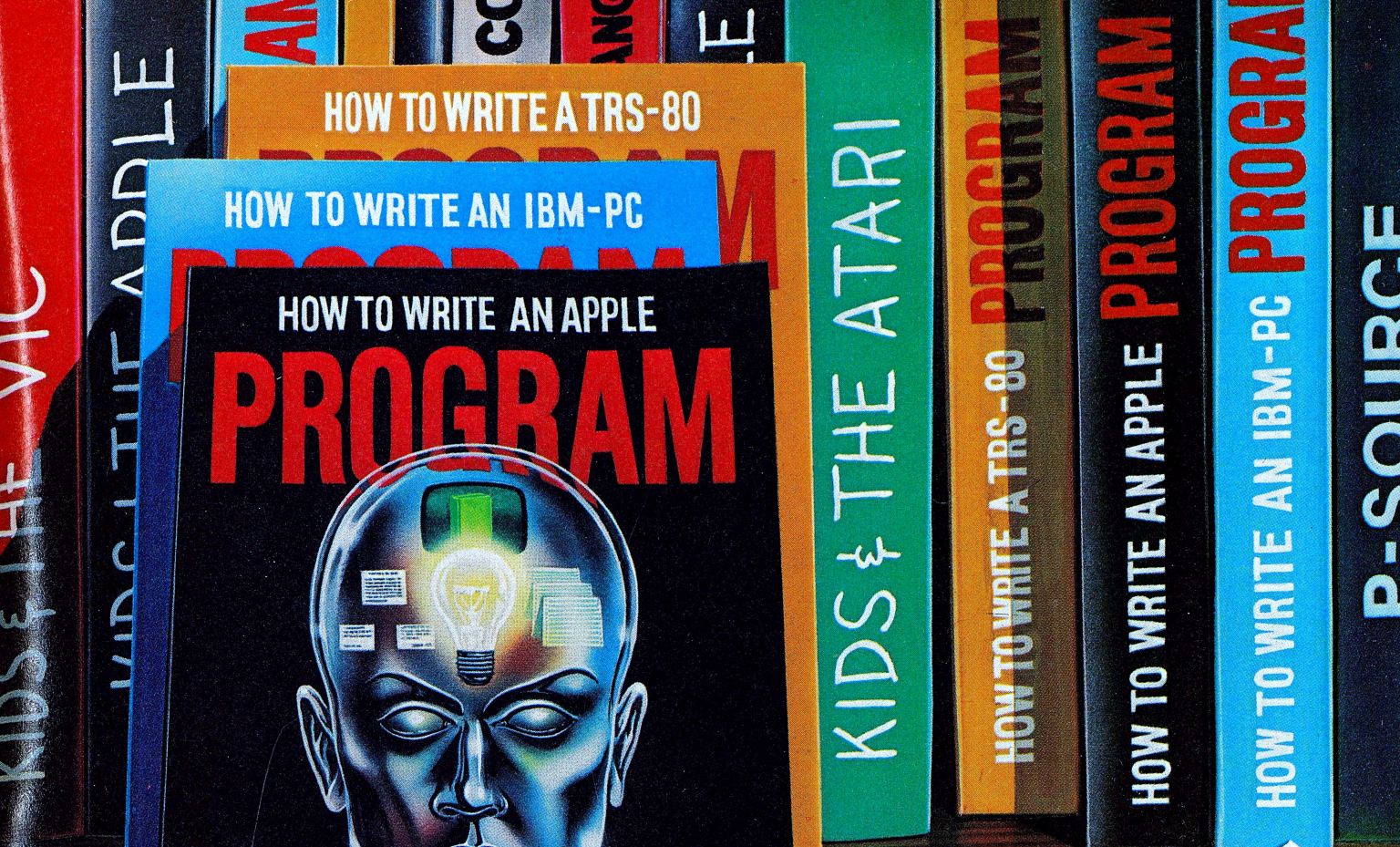

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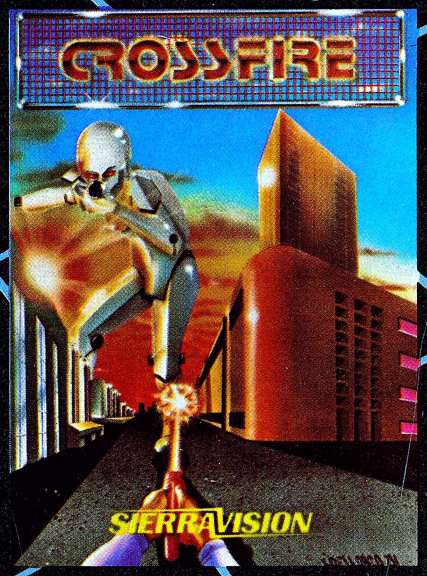

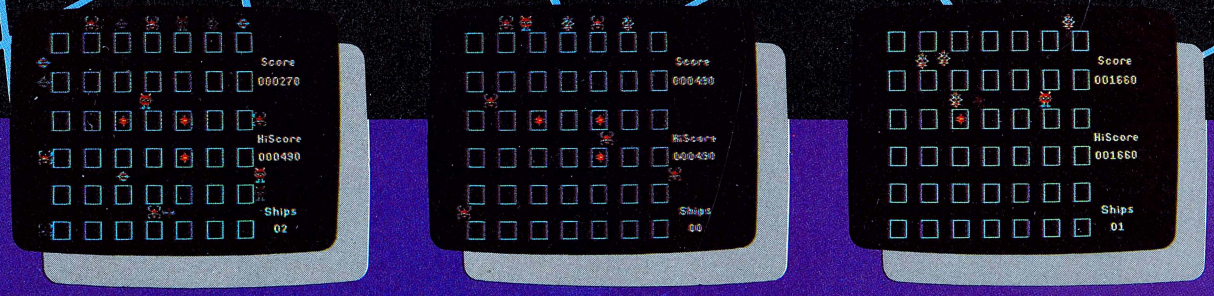

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The October results in the IBM Personal Computer marketplace will only reinforce the resolve of the applications publishers to push on through the holidays. While entertainment software was generally holding its own or showing slight sales gains, the products from the two largest applications publishers were going through the roof.

VisiCorp relied on a "buy two products, get one free" approach in an effort to allow its other products to ride on the coattails of *VisiCalc*. MicroPro countered with an offer of the WordPack, which bundled *MailMerge* and *SpellStar* with its strong *WordStar* product.

Both companies experienced salutary results.

VisiCalc opened an enormous distance between itself and competitor *SuperCalc* while denying *WordStar*'s bid to regain first place. *VisiFile* benefited from the offer by jumping from seventeenth to ninth. *VisiTrend/VisiPlot* essentially held its own, going from fifteenth and sixteenth. And new market entry *VisiSchedule* narrowly missed making the Top Thirty.

The marketing strategy for *WordStar* opened a similar gap over chief competitor *EasyWriter II*. In addition, *MailMerge* jumped from twentieth to eleventh and *SpellStar* vied with *VisiSchedule* to see which program could miss the Top Thirty by the smallest margin.

Several other programs made big jumps during October. *FriendlyWare PC Introductory Set* reclaimed fourth place after September's eleventh-place showing, as novice pc owners continue to show their appreciation for the novel value of the package.

Asynchronous Communications Support jumped from eighteenth to sixth for no discernible reason. *TIM*, which sat third among database titles last month, took over leadership in that category, vaulting past *VisiFile* in its move from twenty-first to seventh.

General Accounting from BPI rose four places to eighth. *Crosstalk* leaped nineteen spots to tenth.

Highest rated of the newcomers to the list was *dBase II*, which grabbed fifteenth. Tied for twenty-second was another rookie, *Space Strike* from DataMost, which displaced that company's *Pig Pen*. *IBM Pascal* rejoined the list after a month's absence.

Two other additions to the list reflect an anomaly seen in other microcomputer markets as well. Both are *Accounts Receivable*—BPI's version being tied for twenty-seventh and Peachtree's version in a dead heat for twenty-ninth. In all accounting packages, the general ledger module way outsells the other modules, with the accounts receivable module usually maintaining a healthy lead over accounts payable or payroll.

While it seems perfectly natural that companies spend more time worrying about the general condition of their financial health and about the money they're owed, it's curious to ponder on whether there's more meaning here than meets the eye. Do the small businesses generally on a collision course with disaster because they're easier to keep track of them than it is clients? Or are small businesses generaly on a collision course with disaster because they're paying attention to only one-half of the cash flow conundrum? What a project for some enterprising marketing research firm.

Big losers in October, at least relatively speaking, were Infor-

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Consider.

The pair brought out *Home Money Minder*, a perfectly respectable home finance package. Then they listened to the user feedback. The result was *Home Accountant*, one of the phenomenal success stories of the first half of 1982.

Around the same time *Home Money Minder* hit, the team also tested the market with *The Mailroom*. Mailroom never was the success of *HMM*, but the authors used the same technique – listen to the users and incorporate all the good ideas. The result is **1st CLASS MAIL** – a program that, incredibly enough, manages to live up to its double-entendre name.

All of the above is not to accuse Schoenburg and Pollack of putting out the programming equivalent of stalking-horses to do their market research for them. Their original efforts do stand on their own merit. They just pale next to the sequels.

1st CLASS MAIL is so well thought out and so easy to use that other publishers who call their programs "user friendly" should bow their heads in shame.

SOFTALK got an early release of the program sans documentation. Yet a rank computer illiterate was able to apply the program to two separate uses with relatively little trouble. This is high praise indeed: that a novice operator could use a powerful program with no more than the screen menus.

The program allows for twelve fields, clearly more than the traditional name and address of a mailing label. The implication is that the software can be put to other innovative uses as well. The built-in ability to sort and filter on any field or combination thereof enhances the chances that users will find multiple applications for the program.

Continental Software will actually be publishing four versions of the program.* The one already in release is for the Apple II using floppy disks. A hard-disk version will follow. Both versions are pending for Apple III as well, awaiting the development of a rapid binary sort subroutine.

1st CLASS MAIL is a first-rate program for specialized data base applications.

Reviewed by Al Tommervik, Publisher, Softalk.

***Available for: Apple II,™ Apple III™/III with Profile,™ IBM-PC™/IBM-PC with Tecmar™ hard disk/IBM-PC with Davong™ hard disk.**

Continental Software

Continental Software, 11223 South Hindry Avenue
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mation Unlimited Software and Infocom. IUS saw *EasyWriter II* lose ground to *WordStar* as it dropped to twelfth. The strength of *TIM, VisiFile,* and *dBase II* knocked *EasyFiler* off the chart.

Infocom's situation was different. The arrival of *Zork III* and *Starcross,* both of which knocked on the door of the charts, seemed to have conflicting impacts on the market. Many retailers reported *Zork III*'s introduction as fueling sales of *Zork I* but hurting *Zork II. Starcross* seemed to have an impact on *Deadline* even though the new program is science fiction and its predecessor is a mystery. All three of the established titles dropped out of the top ten, *Zork I* going to thirteenth, *Deadline* to twentieth, and *Zork II* to twenty-fifth.

Software sales were gaining momentum in October, heading toward Christmas; but the increase was not of the same magnitude as the increase in system sales. A harbinger of change in that situation may be that there were fully 35 percent more titles in the market in October than in September. That's the biggest monthly increase in new software product, both in percentage and in actual numbers, of any month since IBM entered the market.

There'll be plenty of product for Christmas. Soon we'll know how pc owners react to greater choice. VisiCorp and MicroPro have their money on old favorites. Let the upstarts take note. ▲

IBM Personal Computer sales outlets representing approximately 7.3 percent of all sales of pc and pc-related products volunteered to participate in the poll.

Respondents were contacted early in November to ascertain their sales for the month of October.

The only criterion for inclusion on the list was the number of units sold—such other criteria as quality of product, profitability to the computer store, and personal preference of the individual respondents were not considered.

Respondents in November represented every geographical area of the continental United States.

Results of the responses were tabulated using a formula that resulted in the index number to the left of the program name in the Top Thirty listing. The index number is an arbitrary measure of relative strength of the programs listed. Index numbers are correlative only for the month in which they are printed; readers cannot assume that an index rating of 50 in one month represents equivalent sales to an index number of 50 in another month.

Probability of statistical error is plus or minus 4.1 percent, which translates roughly into the theoretical possibility of a change of 4.87 points, plus or minus, in any index number.

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the top thirty

This Month	Last Month	Index	
1.	1.	243.56	**VisiCalc,** Software Arts/Dan Bricklin and Robert Frankston; VisiCorp, IBM
2.	2.	225.15	**WordStar;** MicroPro
3.	3.	99.83	**SuperCalc;** Sorcim
4.	11.	77.18	**FriendlyWare PC Introductory Set,** Michael D. Yaw, James J. Davis, Frank Smith, Alan Vanchura, John Leatherwood, and Bruce W. Moore; FriendlySoft
5.	7.	53.10	**Home Accountant Plus,** Mike Farmer, Bob Schoenburg, Larry Grodin, and Steve Pollack; Continental Software
6.	18.	48.15	**Asynchronous Communications Support;** IBM
7.	21.	46.73	**Total Information Management;** Innovative Software
8.	12.	46.02	**General Accounting,** John Moss and Ken Debower; IBM (BPI)
9.	17.	44.61	**VisiFile,** Creative Computer Applications/Colin Jameson and Ben Herman; VisiCorp
10.	29.	39.65	**Crosstalk,** Microstuf
11.	20.	38.94	**MailMerge,** MicroPro
12.	4.	38.23	**EasyWriter II,** Basic Software Group; Information Unlimited Software
13.	5.	36.11	**Zork I;** Infocom
14.	8.	34.69	**Microsoft Decathlon,** Microsoft/Tim Smith; IBM
15.	—	31.86	**dBase II,** Wayne Ratcliff; Ashton-Tate
16.	25.	31.15	**Basic Compiler,** Microsoft; IBM
	15.	31.15	**VisiTrend/VisiPlot;** VisiCorp
18.	25.	27.61	**General Ledger;** IBM (Peachtree Software)
19.	24.	26.91	**Microsoft Adventure,** Gordon Letwin (Will Crowther and Don Woods); IBM (Microsoft)
20.	9.	26.20	**Deadline;** Infocom
	29.	26.20	**Volkswriter,** Camilo Wilson; Lifetree
22.	10.	24.78	**Typing Tutor,** Michael Sierchio (Dick Ainsworth and Al Baker); IBM (Microsoft)
	—	24.78	**Space Strike,** Mike Abrash; DataMost
24.	15.	23.36	**MBA;** Context Management Systems
25.	6.	21.95	**Zork II;** Infocom
26.	—	19.12	**IBM Pascal,** Microsoft; IBM
27.	13.	18.41	**Macro Assembler,** Microsoft; IBM
	—	18.41	**Accounts Receivable,** BPI; IBM
29.	14.	17.70	**Temple of Apshai,** Jeff Johnson, John Freeman, and J. W. Connelly; Epyx/Automated Simulations
	—	17.70	**Accounts Receivable,** Peachtree Software; IBM

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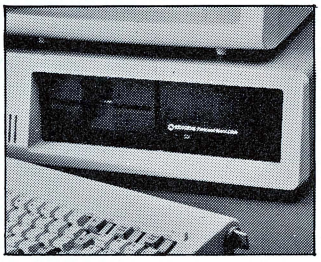

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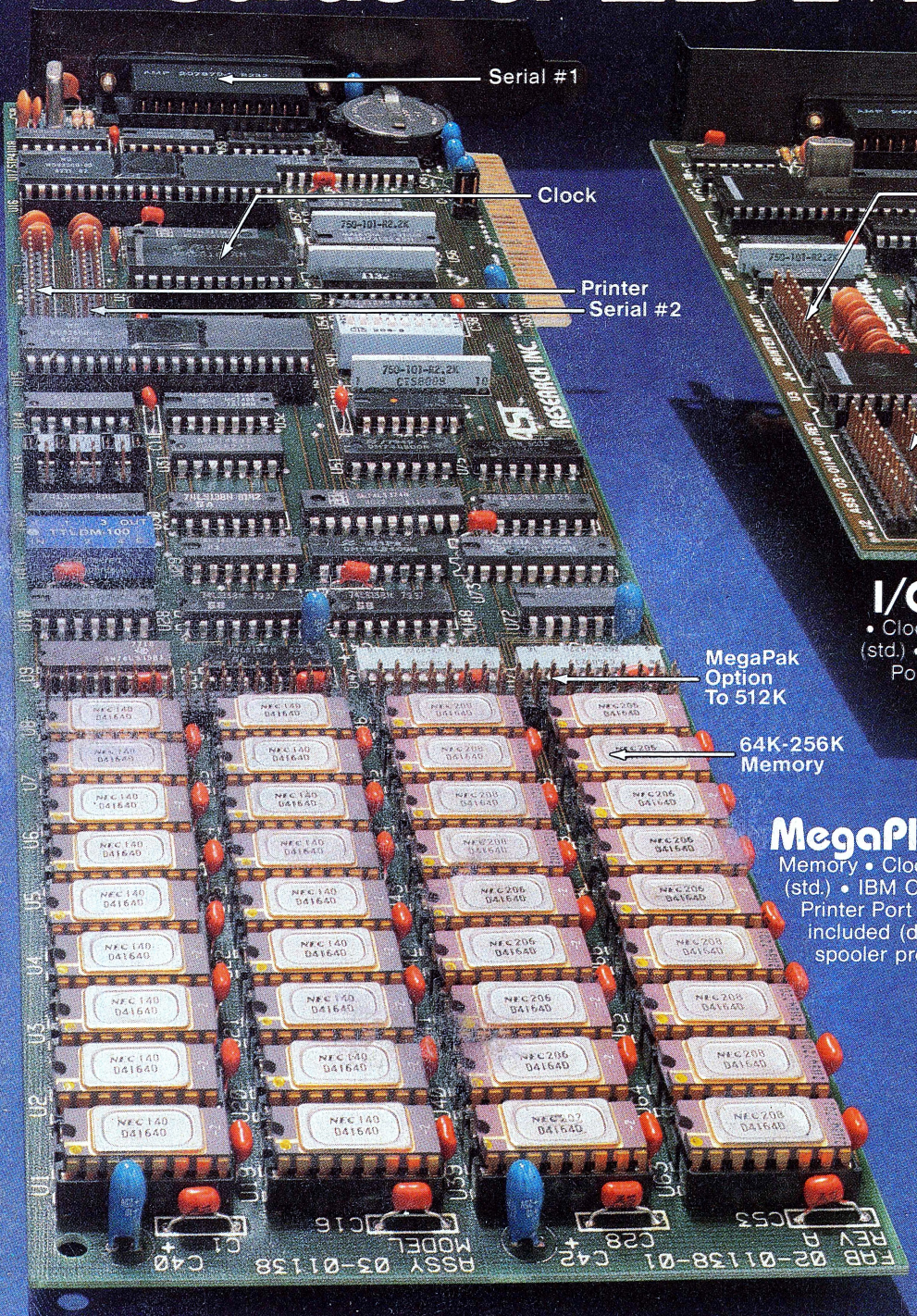

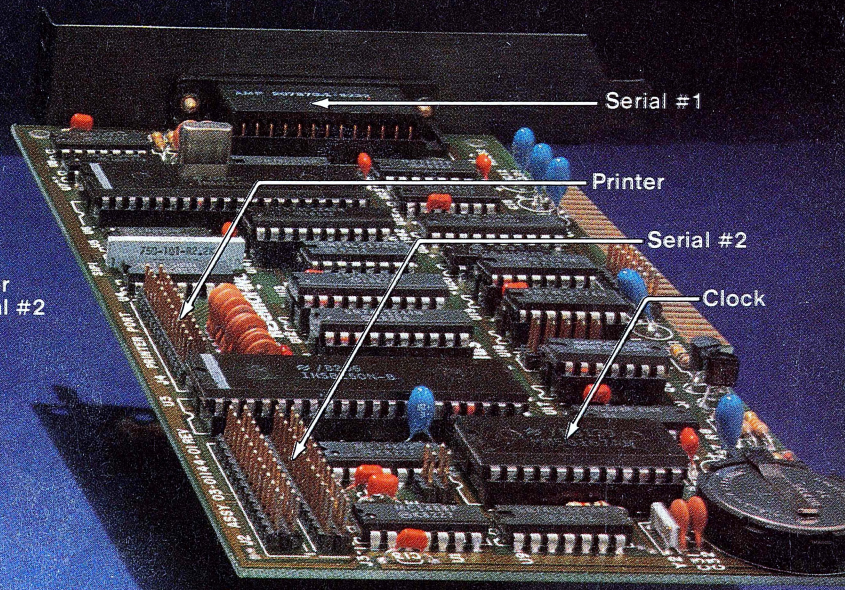

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